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Mainframers Expand User Options

•Burroughs Has B1800 Systems

By Esther Surden
Of the CW Staff

DETROIT – Designed for small- and medium-scale users, the Burroughs Corp. B1800 series introduced last week provides 40 times the throughput in half the space of the B1700 systems it replaces, according to a vendor spokesman.

The systems are comparable to the IBM 3/12 on the low end and to the IBM 370/115-2 on the high end, he added.

Three models of the 1800 series were announced:

- The B1830 features a processor oper-

(Continued on Page 7)

•Univac Adds 1100/80 Family

By Esther Surden
Of the CW Staff

NEW YORK – Univac unveiled last week two large-scale systems said to be in the performance range of the IBM 370/168-3.

The 1100/80 series introduced includes the 1100/81 single-processor system and the 1100/82 dual-processor unit. The series has "two times the performance" of the firm's earlier 1100/40 series, according to a spokesman.

The systems, which will be available in the first quarter of 1977, will range in

(Continued on Page 7)

•IBM Extends SNA Functions For Distributed Processing

By Ronald A. Frank
Of the CW Staff

WHITE PLAINS, N.Y. – IBM has extended the distributed processing functions of its Systems Network Architecture (SNA) by enhancing the ability of its 3705 front ends to perform multiple processor network control operations.

The SNA upgrades are software-oriented and include an Advanced Communications Function (ACF) capability that operates on the earlier Virtual Telecommunications Access Method (Vtam), Telecommunications Access Method (Tcam) and Network Control Program/Virtual Storage (NCP/VS).

The ACF versions of Vtam, Tcam and NCP/VS together with the Multisystem Networking Facility (MNF) make it possible for terminal users connected to one 3705/370 configuration to access programs residing in other 3705/370 configurations. With the extended SNA capabilities, more network control functions for handling data traffic reside in the 3705 front end, IBM explained.

Multiple 370s can be linked via 3705 front ends which transmit data to each other in full-duplex mode using IBM's Synchronous Data Link Control (SDLC) at speeds up to 56 kbit/sec. Traffic flow in the network can operate in a distributed pattern between the 3705s operating under ACF/NCP/VS, thereby freeing the network's mainframes "to perform more work on more applications for more users," IBM said.

The MNF allows the distribution of applications and data bases across several 370 systems in different locations for security or backup; if one network mainframe is not operational, network traffic with other hosts can continue under control of the 3705s.

The MNF allows data to be routed automatically, avoiding line switching under manual control from a CPU console

(Continued on Page 5)

And Boundary Getting Fuzzier

No DP-Communications Line, FCC Told

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. – No logical technical boundary can be drawn between computing and communications, experts in the area resulting from the marriage of these fields told the Federal Communications Commission (FCC) at a planning conference here last week.

Arranged by the American Federation of Information Processing Societies (Afips), the conference concluded that distinctions which now exist between computing and communications will only blur as time goes on, thus further complicating the FCC's regulatory job.

The commission is charged with regulating communications services, but not with monitoring them, according to FCC Chairman Richard Wiley.

The panel of technical experts, led by Vinton G. Cerf (who recently left a teaching position in electrical engineering at Stanford University to work with the Information Processing Techniques Office of the Defense Advanced Research Agency), agreed, however, that a regulatory climate is needed "which will encourage innovation, ensure a reliable in-

Coverage of the FCC Planning Conference continues on Page 8.

terconnection of primary services and promote the acquisition of capital for growth."

In addition, the panel of four concurred that "packet switching as a technology is having an important effect on computer communications and will profoundly affect frequency allocation."

Finally, the panelists asked the FCC to recognize that high local access costs, international link costs and user learning costs are limiting the growth of computer communications services.

(Continued on Page 2)

Terminal Debuts, Enhancements Accent Info '76

By Ronald A. Frank
Of the CW Staff

CHICAGO – Data terminal innovations and enhancements were stressed at the Info '76 conference here last week.

Informer, Inc. of Los Angeles introduced a terminal-oriented bank system that allows tellers to display customer signatures on a standard CRT screen. Signatures can be stored in digitized form in a CPU and called up for verification in on-line mode over private lines at 2,400 bit/sec, the vendor said.

Signatures can be entered into a CPU from checks or any other conventional document and multiple signatures can be displayed on a single CRT screen, a spokesman added. Up to three keyboard display terminals can be clustered on a microprocessor controller.

The signatures are displayed in a matrix of 192 by 64 points with handwriting displayed "slightly larger than lifesize," according to the spokesman.

A system including a signature capture unit, one keyboard display terminal and the controller costs $7,500; individual terminals cost $2,450 each. An upgrade for operation at 9,600 bit/sec will be introduced after the first of the year, the spokesman said.

As expected, AT&T demonstrated its 43 Teleprinter which operates at 10- or 30 char./sec over dial-up lines using the plug and jack arrangement approved by the Federal Communications Commission [CW, Nov. 8].

The portable terminal uses an upper- and lower-case character set. A magnetic drive print head generates 9 by 7 dot matrix characters on 12-in. wide paper.

Utilizing 132 column/line printing, the fanfold paper is available from one forms supplier, but others are expected to supply the paper later, an AT&T spokesman noted.

First tariffs for the 43 Teleprinter will be

(Continued on Page 6)

Attendees at Info '76 heard more than 200 speakers in over 80 technical sessions covering 11 specialized topics.

The exhibition included 137 companies and show registration was estimated at 11,300.

The 1977 Info conference will be held Oct. 17-20 in New York. Additional coverage of this year's conference begins on Page 9. Photo feature on Page 2.

CW Photo by A. Dooley

Bob Tabernacki tries out the AT&T 43 Teleprinter on a visit to the Info '76 exhibit hall last week.

Calcomp vs. IBM Start Delayed; Judge Admits Comstat Data

By Molly Upton
Of the CW Staff

LOS ANGELES – IBM attorneys fought California Computer Products Corp., Inc.'s (Calcomp) request for a jury trial both before and after jury selection here last week in the Calcomp vs. IBM antitrust trial.

Originally scheduled to begin last Wednesday, the trial should start today or tomorrow in federal district court.

Even before the trial began, there were signs this trial would be different in many ways from the 18-month-old U.S. vs. IBM antitrust trial in New York.

IBM's lead attorney, David Boies, indicated he intends to call a number of top IBM executives as his witnesses in the case. By contrast, IBM executives answered government subpoenas and appeared in court in New York, but did not take the stand [CW, Oct. 25].

In protesting the trial by jury, Boies asked Judge Ray McNichols to strike having a jury or, alternatively, to strike the particular jury panel selected last Tuesday for the case.

The jury does not satisfy a constitutional requirement for cross-representation, Boies told the court, adding all jurors appear to be of one economic classification.

With estimates for the trial's duration

(Continued on Page 5)

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Info '76 attendees watch demonstration of IBM Word Processor/32.

Under the Datapoint Arches

'Cummins and See Us Some Time'

Info Sights

CW Photo Feature
By Ann Dooley

Attendees try out throwing arm at Atlantic Software booth.

Nixdorf's Ray Stimson demonstrates the Model 8870 teletypewriter for Don Rubovits and L. Patrick McClure.

Experts See No Line Between DP, Communications

(Continued from Page 1)

Joining Cerf on the panel were Lynn Hopewell, chairman of the IEEE Computer Society Committee on Computer Communications and senior member of the executive staff of Computer Sciences Corp.; Alex Curran, past chairman of the International Federation for Information Processing's Technical Committee on Computer Communications and president of BNR, Inc.; and Donald Dunn, professor of engineering/economic systems at Stanford University.

Cerf chaired the ad hoc Afips committee composed of these men. Selected to participate in this planning conference on the basis of their technical abilities, they provided the FCC with its first formal examination of the relationship between computer and communication technologies since the commission's first "Computer Inquiry" in 1971.

For Afips, the planning conference represented the kind of contribution this federation of 15 constituent societies hopes to make in the federal policy-making process through its 18-month-old Washington, D.C., office, according to Executive Director Robert W. Rector.

Under the direction of Philip S. Nyborg, the Afips Washington office is intended to carry out the federation's goal "to provide objective information to assist policymakers in reaching technically sound results," Rector said.

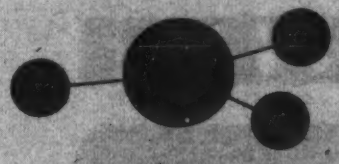
On the Inside This Week

Announcing the next generation of on-line software

TASK/MASTER® Version II

With features that no other communications monitor can match!

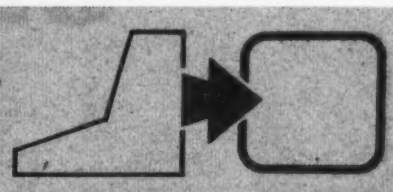
Distributed Processing



TASK/MASTER - Version II is the software breakthrough in distributed processing the industry has been waiting for. TASK/MASTER's distributed processing features provide the consistent architecture required to interconnect any combination of IBM System/360 and System/370 processors to form a distributed network. Full compatability is maintained with IBM's SNA and SDLC protocol.

With TASK/MASTER, the limitations (and interface problems) of using minicomputer-based systems as satellite processors disappear. Each location in your network can now have a full-feature mainframe with standard peripheral devices, standard operating systems, and the use of a wide range of proven software for both batch and on-line applications.

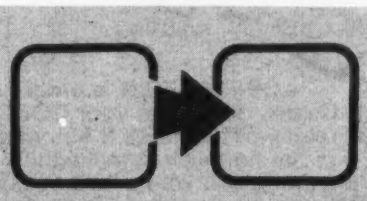
Programmerless Systems



Version II of TASK/MASTER starts a new trend toward "programmerless systems". One example is Message Management, a powerful application development feature that can cut your programming costs by over 50%. Message Management allows the actual "end user" to sit at a terminal and, with the help of the computer, design data formats and specify editing rules. Message Management then automatically builds the input and output portions of the application program.

Another example is TASK/MASTER's Data Entry Feature, a complete on-line data entry system that requires no application programming. Data Entry has facilities which are simply not available with stand-alone systems, including 100% data editing through on-line access to your database.

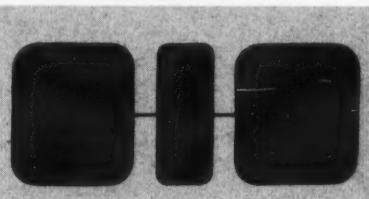
CICS To TASK/MASTER



CICS users can now become TASK/MASTER users with a minimum of effort. The CICS-to-TASK/MASTER Feature of Version II converts source programs written for CICS to source programs which will operate with TASK/MASTER. Conversion is simple, accurate, fast, and effective. A minimum of 90% of the CICS-related source statements in a program will be automatically converted to their TASK/MASTER equivalents. For many applications the conversion rate will be 100%.

Conversion from CICS is a one-time batch process. Once a program is converted it runs as, and can be maintained as, a native TASK/MASTER program. New code to take advantage of the TASK/MASTER features not available with CICS can be added at any time.

Standard Interfaces



TASK/MASTER is the only communications monitor that has developed a standard interface to any database system, including those that are "home-grown". TASK/MASTER also provides multi-tasking support even when not supported by the database system itself. No programmer retraining is required to go from batch to on-line use.

TASK/MASTER's standard interface allows the selection of the best database system to meet the needs of your installation, without compromising when it comes to choosing a communications monitor. Because the interface with TASK/MASTER is at the functional level, the database system can be fully isolated from the on-line environment. This includes operation within a separate processor which acts as a "back end" to the main system.

These are just a few of the innovations that can dramatically affect the success of your on-line system.

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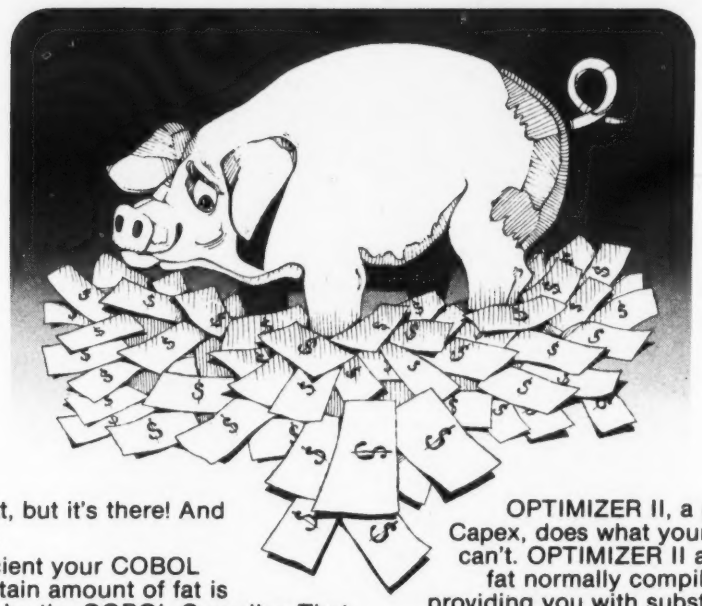

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IBM Extends SNA Distributed Processing Functions

(Continued from Page 1)

or by user-written operator procedures, IBM said.

For large central site configurations, the 3705-II can now be shared by up to four 370 mainframes in the same location while the 3705-I can be shared by two 370s. This provides terminal users at the same site with access to applications in multiple hosts in a local mode network, according to the vendor.

The ACF/Vtam system can be enhanced with a Network Operating Support Program (Nosp) which supplies extended network management by routing commands to a specific system in the network and returning the responses to the originating terminals, IBM said. The Nosp also allows a 3270 CRT to control network functions instead of the CPU console.

The ACF functions can operate with 370s running under DOS/VS, OS/VS1 or OS/VS2 SVS or MVS. A 3705 with ACF/NCP/VS can be shared by ACF/Vtam and ACF/Tcam program products as well as by the latest current level of the basic Vtam and Tcam system control programming, IBM said.

An ACF upgrade requires the basic Vtam and Tcam versions which are referred to as the systems control programs plus the ACF versions of the access methods. The basic versions are available at no cost while the ACF versions and their associated program products are available under a monthly license fee.

In order to implement ACF/NCP/VS on a 3705, a System Support Program (SSP) is used to generate the NCP version in a host 370. It is then loaded from the mainframe into the 3705 front end.

JES2 Enhancement

IBM also introduced a Network Job Entry (NJE) facility for the Job Entry Subsystem 2 (JES2) which operates under OS/VS2 MVS. The NJE allows a user to define a network consisting of multiple CPUs connected at a single site or via a network using multileaving protocols between separate locations, IBM said.

Jobs can be entered through any supported 370 in the net, directing the work to the mainframe that has access to the data sets and application programs needed to run the job. NJE also allows the user to utilize SNA concepts for CPU-to-CPU batch transmissions, IBM said.

All the SNA programs and licensed program products are available for a monthly fee, and each implementation in a host requires a separate monthly charge.

Monthly license fees apply as follows according to operating system:

PROGRAM PRODUCT	DOS/VS	OS/VS1 & 2
ACF/Vtam	$125	$200
Multisystem Networking Facility	$325	$600
ACF/Tcam		$200
Multisystem Networking Facility		$800

The monthly license fee is $100 for ACF/NCP/VS, $50 for SSP for ACF/NCP/VS and $125 for Nosp. These three program products operate with DOS/VS and OS/VS1 and 2, IBM said.

First customer shipments of the program products will range from the fourth quarter of 1977 to the second quarter of 1978, depending on the particular operating system.

Start Rescheduled For Calcomp vs. IBM

(Continued from Page 1)

ranging from four to six months, Boies said he recognized the inherent economic selection process in effect since McNichols seemed to "automatically" excuse those persons seeking dismissal whose salaries were substantially more than the $20/day paid to jurors.

As an alternative, Boies suggested the possibility of drawing another jury that would sit for a limited number of days each week. This, he suggested, might allow a wider mix of people from different economic strata.

McNichols declared the jury represents valid cross-section, observing they had been drawn from a pool of about 70 people. One hundred fifty names were drawn for the pool and McNichols dismissed all 80 who requested not to serve.

Of the 12 jurors selected, five were men. The jurors' occupations include quality control inspector, homemaker, recent college graduate seeking a teaching position, window cleaner supervisor, airlines clerk and carpenter.

One juror works in the mail order department of a firm and another handles distribution for a gas company. Two are unemployed. Four have previously served as jurors on criminal cases.

'Housekeeping Matters'

The postponement of the trial's opening was designed to allow attorneys to tend to some "housekeeping matters," according to Boies, who is with Cravath, Swaine and Moore, the same firm handling IBM's defense in the New York case. Jack E. Brown of Brown and Bain in Phoenix, which was called in by IBM in the latter stages of its case against Catamore Enterprises, Inc., is also on the IBM legal team here.

Among the "housekeeping matters" discussed Wednesday was whether IBM's Competitive Statistics (Comstat) prepared by its Commercial Analysis Department should be entered as evidence.

After listening to Boies and Maxwell M. Blecher of Blecher, Collins and Hoecker, Calcomp's lead attorney, debate the point for over two hours, McNichols ruled that the Comstat data should be introduced to the jury as Blecher had requested.

Boies reiterated the argument heard in New York that the Comstat data was inaccurate and acknowledged to be so by IBM personnel. Since there was more accurate data on market share in the industry available from censuses 1 and 2 prepared for use in the Greyhound and U.S. cases, there was no reason to confuse the jury, he said.

Boies admitted to McNichols the census data shows IBM has a smaller market share.

Blecher emphasized the censuses would not give IBM's perception of the DP marketplace or how it divided the market into categories. Also, he pointed out, the first census did not begin until 1971.

Toward the end of the debate, Blecher said if the Comstat data was not admitted, the judge might as well throw the case out.

In ruling Comstat admissible as business records, McNichols said there may be continuing objections on Comstat.

Info '76 Accent on Terminal Debuts, Enhancements

(Continued from Page 1)

filed by Southern Bell, Michigan Bell, Pacific Telephone and Telegraph and Pacific Northwest Bell, the spokesman said, adding the tariffs will be filed "in December and January."

Only interstate tariffs are planned at present with a two-tier pricing scheme offered on one-, two- and three-year leases. Under this plan, front-end payments will cost "above $100/mo with a later reduction to about $25 to $30/mo. Straight monthly lease rates will be $85 to $100/mo depending on individual tariffs," AT&T said.

The 43 Teleprinter includes a built-in buffer for operation at a top speed of 47.6 char./sec to keep up with a true 300 bit/sec data rate, the AT&T spokesman explained. OEM versions of the 43 Teleprinter without the built-in modem will cost about $970 with an RS-232 interface, a spokesman for Teletype Corp. said.

AT&T also introduced its first two-wire, full-duplex 1,200 bit/sec modem called the 212A.

The data set operates at speeds up to 300 bit/sec or 1,200 bit/sec. In the answer mode, the unit recognizes the incoming signal and automatically selects the correct transmission speed, the AT&T spokesman said.

The 212A, also known as the Dataphone 300/1200, is compatible with Bell 100-type data sets, he added.

In the low-speed range, the 212A operates asynchronously; it operates in either synchronous or character-oriented asynchronous mode at 1,200 bit/sec.

There are no plans to file interstate tariffs for the 212A, the Bell spokesman noted. The data set will cost about $40/mo and a two-tier pricing plan will be announced later.

First tariffs will be filed by Southern Bell and Pacific Northwest Bell after January and the data set will be available from most Bell companies by the first quarter of 1977, he added.

Another Info '76 introduction from AT&T was the 103J data set, described as an upgrade for the 103A originate/answer modem.

Called the Dataphone 300, the unit is compatible with the earlier 103 models and all 113-type data sets. It operates with the low-speed mode of the Model 212A at 300 bit/sec, AT&T said.

The 103J will cost about $25 to $30/mo, the spokesman estimated. It is a smaller LSI unit with improved diagnostics over the 103A, he said.

AT&T will replace its answer-only 113B with a 113D and the originate-only 113A will be replaced with a 113C next year, the spokesman said.

Delta Data Workstation

Delta Data Systems Corp. of Cornwells Heights, Pa., showed its 4700 workstation which includes an intelligent CRT with floppy disk storage.

The system includes programmable emulation features compatible with Honeywell, Burroughs and Univac CPUs, a spokesman claimed.

An IBM emulation version will be introduced in January, he added. The system costs about $7,000, depending on features.

Delta Data also introduced a light pen priced at $900 which can be used on most of the company's CRT terminals. In addition, the firm showed a microprogrammable display terminal compatible with Univac, Burroughs and Honeywell CPUs priced at $130/mo on a one-year lease with maintenance or $2,400 purchase.

MSI Data Corp. displayed its Source 2200 data entry terminal with optical wand scanner that can read MSI bar code and the Codabar marking system from Monarch Marking Systems, Inc.

The portable terminal, which operates from battery power and was designed for retail store environments, is priced at $1,875 to $3,200.

The OCR Division of Key Tronic Corp. of Spokane, Wash., showed its M9 system designed to operate with the firm's data readers and OCR wand. The multiple-font recognition system handles 200 alphanumeric char./sec and costs $10,000 to $25,000, depending on options.

Cummins-Allison Corp. of Glenview, Ill., introduced its 5400 Keyscan key-to-disk data entry system that includes a 480 nsec processor with a disk storage subsystem.

A typical system with a 64K CPU, 9.8M-byte disk storage, 10 keystations, a 600 line/min printer and a tape drive costs $2,339/mo plus $536/mo for maintenance, the firm said.

Decision Data Computer Corp. of Horsham, Pa., introduced a series of printers and card readers designed to operate with IBM mainframes. Five printers, ranging in speed from 300- to 1,500 line/min, were introduced.

Called the 6600 series, the units cost $21,750 to $45,750, depending on features.

The card units handle 80- and 96-column cards and range in price from $9,000 to $14,000, Decision Data said.

Univac 1100/80 Matches IBM 370/168-3 Performance

(Continued from Page 1)

price from about $2 million to $6 million or $50,000- to $100,000/mo on various lease plans, the firm said.

Current Univac 1100 users can upgrade to the 1100/80 without replacing peripherals or converting programs, the spokesman claimed.

The CPU is used "only to execute programs," the firm noted. It features a 50 nsec cycle time.

Memory for the systems in the 1100/80 series includes both a backing store and cache buffer. The basic backing store includes 512K 36-bit words of semiconductor memory expandable in 256K increments to 4M words and it features parity and error-correction code bits.

In addition, all programs and data are loaded into a 125 nsec 8K buffer for execution. Eight words at a time are fetched from the backing store into the buffer, the firm explained.

The cache is expandable to 16K words; backing store access time to the buffer is 1.25 μsec, the spokesman added.

An Input Output Unit (IOU) controls the transfer of data between the peripherals and main storage. The unit includes a control section and a channel section containing two to four I/O channel modules.

The basic module includes one byte-multiplexer channel and one block-multiplexer channel. The remaining modules may be either byte, block or word channels, Univac said.

Up to four additional channel units can be added to the IOU and a second IOU can also be added to the system, the firm said.

The byte I/O feature, a feature not previously available on Univac systems, transfers one byte at a time and interleaves bytes from each unit record device. The transfer rate is 200 kbyte/sec. Block transfers take place at 1.5M byte/sec.

The CPU and IOU operate on a single buffer, the firm noted; by means of multiple paths to memory, the buffer can handle the request rate of a multiprocessor configuration. The CPU is timed to run instruction overlap with the buffer memory, the firm said.

The Transition Unit connects all the system's central components and receives a periodic pulse which, if interrupted, can initiate an automatic rebootstrap of the system, the firm noted.

The system can also "automatically initiate an alternate configuration" to divide the system into two or more electronically separate systems.

A separate processor provides for diagnostic checkout and fault isolation of the CPU and IOU. Internal registers and logic nodes can be displayed on a Uniscope 200 CRT.

A minimum 1100/80 configuration with 524K words of backing store; an 8K word buffer; I/O channel expansion, word channel features and block multiplexer expansion; dual-access disk storage of eight 8434 spindles and two control units; a dual-access 6,250 bit/in. tape system with six drives and two control units; a 1,400 line/min printer; one 1,000 card/min card reader; and a 250 card/min punch costs $51,451/mo on a five-year contract or about $2 million.

Burroughs B1800 Smaller Than B1700

(Continued from Page 1)

ating at 5M cycle/sec. Memory is expandable from a minimum 48K bytes to a maximum 256K bytes.

- The B1860 with 64K to 384K of memory operates at 6M cycle/sec. It features a 4K bipolar microinstruction cache memory with an 83 nsec/byte read cycle time.
- The B1870, which also has the microinstruction cache memory and a 6M cycle/sec processor time, can store up to 512K bytes of disk storage.

The B1800s are object code-compatible with B1700 systems and programs written for a B1700 can be run on a B1800 without modification, Burroughs said.

Compatibility with the B80 small business system is maintained through the B80 Computer Management System software. While B80 object code programs can be run on the B1800 without change, users who want to optimize use of the B1800 will have to recompile programs, the spokesman noted.

The B1800 systems are said to be suited to both batch and on-line transaction-oriented applications and can serve as stand-alone systems or units in a decentralized network.

Memory for the system is 4K MOS chips. Read cycle time is 400 nsec/byte for the 1830 and 333 nsec/byte for the 1860 and 1870.

Microinstruction cache memory replaces the control memory on the B1700. Its function under hardware management is to ensure the most used microcode is in the cache for use by the system, the spokesman explained, noting the cache on the 1800 does not store data.

On the B1870, 5.9M bytes of auxiliary disk storage is used as part of the system's memory. A head-per-track disk with a 5 msec average access time, it is used as a virtual memory for the operating system.

CPU size reduction has been achieved through the use of Burroughs Current Mode Logic in the 1830 and the CTL III complementary transistor logic in the B1860 and 1870, the firm said.

Software introduced with the B1800 includes an enhancement of Burroughs' distributed processing capability so the systems can be used either as hosts or as terminals in remote job entry mode.

Audit entry software allows the user to get formatted information on either cassette or minidisk, he added.

The B1800 series also features virtual memory capability and multiprogramming under the Master Control Program (MCP).

Up to 14 individual channels for I/O and subsystems can be accommodated on a B1800. I/O units include removable and nonremovable disk storage, line printers, document readers and sorters, magnetic tape and cassette drives, an industry-compatible minidisk, card devices, a console printer and displays.

System prices range from $2,600/mo or $108,700 for a typical B1830 with 48K bytes of memory, 4.6M bytes of disk, a 160 line/min printer and a 300 card/min reader to $6,500/mo or $275,000 for a B1870 with 128K bytes of memory, 5.9M bytes of system disk, 130M bytes of disk, a 750 line/min printer and a 600 card/min card reader.

In View of Technology, Economics

Hybrid Services Feasible and Preferable: Hopewell

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. – Hybrid services which include computing and communications are not only technologically feasible, they're economically preferable, according to Lynn Hopewell, chairman of the IEEE Computer Society Committee on Computer Communications and senior member of the executive staff of the Computer Sciences Corp.

Speaking at a planning conference held by the Federal Communications Commission (FCC) here last week, Hopewell told his audience their challenge is two-fold: "to allow the regulated carriers freedom and incentive to use computers advantageously" and "to avoid suppressing imaginative entrepreneurial provision of new services in the marketplace by holding the specter of regulation over such enterprise."

As the technologies that make up telecommunications merge further, hybrid systems will gain greater acceptance, Hopewell maintained.

Hopewell suggested to the members of the FCC that hybrid systems, and computer communications as a whole, are part of "a 'revolution' firmly rooted in history."

That history goes back to the commercial revolution of the 15th through 18th Centuries, he said. During this period the decline of feudalism led to the emergence of the national state which, in turn, resulted in stability, the Renaissance, science, discovery and wealth.

The industrial revolution took over then, bringing with it the decline of mercantilism and guilds; the notions of individual rights and protection of property; the convergence of stability, trade expansion, markets and inventions; and the joining of science, capital and markets, Hopewell stated.

The energy era, lasting from 1760-1860, saw substitutions of new energy sources for human labor; the electronic era, from 1860-1950, experienced new ways of communicating; the information era, which began in 1950 and, according to Hopewell, is in progress today, involves new ways of manipulating and creating information.

Just as the development of transportation allowed the conversion of cottage industry to the factory system, telecommunications permits the distribution of computer "factory" products to users, Hopewell argued.

Large Corporation Acceptance

Seventy-five percent of the top 500 industrial corporations are using computer communications, Hopewell said, quoting "the gurus" at International Data Corp.

These companies are concerned, he added, with the control of their business operations – with better information flow, cost savings and productivity increases and scientific management.

Computer communications already has a wide variety of users – from law enforcement organizations and brokerage houses to health, insurance, banking and retail institutions, he told the FCC.

Wide Variety of Users

More consumer-oriented applications are on their way, particularly those which use a Bell Touch-Tone phone as a terminal, but they haven't arrived yet, Hopewell said.

Out of an overall computer market of some $20 billion this year, an estimated $6 billion, or 30%, will be spent on computer communications, he stated, calling this field "the fastest growing, most dynamic sector of the computer industry."

CW at FCC Meeting

FCC 'Quizzed' on Conferencing

By a CW Staff Writer

WASHINGTON, D.C. – "Suppose you are an imaginative entrepreneur and, after much market research and business planning, you are presenting your plan for offering computer conferencing services to the public," Lynn Hopewell, chairman of the IEEE Computer Society's Committee on Computer Communications, suggested to members of the Federal Communications Commission (FCC) assembled here last week.

"A member of your group of potential backers asks: 'I see you are providing a service that seems to be both DP and communications. Will your business be regulated by the FCC?' "

Hopewell's scenario and question highlighted the focus of an FCC planning conference prepared by the American Federation of Information Processing Societies (Afips) to explain the technical concepts involved in telecommunications for the federal agency.

Should computer conferencing – a service that uses shared computer files, remote terminal equipment and telecommunications networks for group communications – be regulated by this federal agency, even when the agency isn't sure? Hopewell asked.

He described the imagined business further: "You will provide terminals to subscribers and arrange for all communications and computer facilities required. Your subscribers will pay only a monthly fee and will not own any equipment or deal with the telephone company.

"Also, your system design architect has told you the lowest cost system will require some text editing to be accomplished in the subscriber terminal."

Wrong Answers

Returning to the question of regulation, Hopewell noted, "If you answer that your service is only DP, surely you must be in error. The basic, fundamental task being performed by computer conferencing is the exchange of messages among different parties.

"If you answer that your service is only communications, surely you must again be in error. The usefulness of the message exchange process would almost entirely disappear if the DP functions (e.g., text editing, delayed and filtered message retrieval) were not performed," he added.

The fundamental service offered is message exchange, Hopewell argued. "You – the entrepreneur – must do business as a common carrier," he concluded.

On second thought, though, "if you are a regular common carrier, the FCC regulations require that you offer DP functions only through a separate subsidiary," Hopewell noted.

But that is "impractical, given the intertwined nature of the total service," he added.

Then the user must become a "resale" common carrier, a brand of communications vendor exempted under FCC rules in such a way as to be able to offer DP services, Hopewell said.

Privacy Act Hit as Administered But Not Enforced

By Nancy French
Of the CW Staff

CHICAGO – If the Privacy Act of 1974 hasn't cost the Federal government a great deal and works all right, why is privacy legislation too costly and too much of a burden for the private sector?

Jack Osborn, director of Purdue University's Information Privacy Research Center, addressed that question here last week by saying, "We don't really know that it 'works' in the government because the law isn't being 'enforced' – it's merely being 'administered.' "

Speaking at an Info '76 session on the implications of privacy legislation, Osborn pointed out the Office of Management and Budget (OMB), the agency charged with "implementing" the Privacy Act, is the President's office of management and budget – an agency with no "enforcement" powers.

In fact, OMB is merely "administering" the law, Osborn said.

Many civil servants claim the Privacy Act is working well in their agencies while others make no secret of the fact that their agencies are "in technical compliance" and that's about it, according to Osborn.

Further, since the Justice Department – an organization with true enforcement powers – has established no organization to deal with privacy violations, litigation is a citizen's only recourse, Osborn said.

The Privacy Act of 1974, which applies only to federal agencies, requires that collected personal information be accurate, relevant and timely. It gives individuals the right to access and correct their government records and forbids information collected for one purpose from being used for different purposes.

The privacy issue is more than a matter of individual privacy – it's a political, emotional issue of "information control," Osborn said.

The thinking on the subject is still pretty hazy since information currently available is largely anecdotal; research completed to date has been limited mostly to present practices, he added.

No one has yet performed an in-depth analysis on a government agency to determine how compliance with the act affects its basic functions, he noted, and no one has done a "what-if" analysis on how different types of privacy laws would affect private industry.

The cost of privacy model – the strategic planning model developed by Robert Goldstein and published by Honeywell Information Systems – comes closest to the kind of "what-if" model Osborn believes is needed, he said.

While the model cannot really be used to estimate exact costs, it can be used to measure the degrees of difference in cost of various approaches, he said.

No matter what type of approach such a private-sector law takes, the individual caught in the middle will be the DP manager, according to James I. Cash, former director of the Purdue University computer center and presently a professor at the Harvard Graduate School of Business Administration.

The DP manager will be faced with implementing new security measures including audit trails and threat-monitoring systems (in which invalid access attempts are monitored) to protect records.

A combination of data-independent access as well as data-dependent access systems will have to be implemented to make sure only authorized users can obtain sensitive personal information, he said.

Purdue's Information Privacy Research Center recently raised $250,000 in grants from a number of private sector organizations, including the Ford Foundation, TRW, Inc., Sears Roebuck, General Motors, IBM and Pittsburgh Plate and Glass, to do more research on the economic impact of privacy as well as societal attitudes toward privacy.

One phase of the study will examine how personal records are actually kept in eight organizations and another phase will look at employees' perceptions of how information is kept, according to Howard Fromkin, associate dean of Purdue's Krannert Graduate School of Management.

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At Info '76

Role of Corporate Auditors Expanding Into DP

By a CW Staff Writer

CHICAGO – As a company's accounts receivable and inventory records disappear into computer data bases, auditors must audit corporations "through the computer" to assure the company is keeping its financial records in accordance with accepted standards of practice, according to John Koretz, manager of computer auditing for Coopers and Lybrand.

Rather than checking "totals" as auditors do in a manual accounting environment, DP auditors check the functioning of computer programs because the computer will always process the data exactly the same way as long as the programs are not altered, he said.

Several techniques are used, Koretz noted. The auditor can prepare computer programs to perform skeletal portions of the user's system as a test; he can write computer programs to extract data from the client's system to analyze; he can analyze the client's computer programs with audit software; or he can simply read program source code.

To certify a data base system, the auditor must make sure the data access controls are in place in order to assure the data base is accessed not only by authorized individuals, but also by authorized programs, he suggested.

One technique is to extract shipping data and billing data from the daily raw transaction file and compare the two. If the totals match, the programs are operating correctly, he indicated.

These types of extraction analyses can be done several times a year using a number of different input and output items at very little cost, he said.

Every time data is moved or transcribed, there is a risk it will be lost or garbled, Koretz noted. Parity checking is one way to reduce this risk.

In parity checking, one bit is added to each group of six, seven or eight bits in order to make each group adhere to a rule such as odd or even count. Any single-bit error will result in a variance.

Check digits enable the user to detect multiple-bit errors and even allow automatic detection of some errors, he said.

Management Underutilizing DP For Planning, Speakers Agree

By a CW Staff Writer

CHICAGO – Corporate planners are to corporations what the National Security Council is to the White House – a think tank, according to Prankash Shah, director of management sciences for Time Sharing Resources, Inc. of Great Neck, N.Y.

In remarks prepared for Info '76, Shah described this think tank as a group of generalists with a broad range of abilities who are able to focus attention on each problem area as it emerges.

Quoting the Canadian author Henry Mintzberg, Shah pointed out, however, that management by computer-aided techniques and planning is not yet the norm in American industry. Most managers still make decisions based primarily on hunches and personal judgment, he said.

Significance in Dispute

While the majority of corporate planners would agree on the need for some computerization in the planning function, not all attach equal significance to it.

For example, Eric White, an economist with Townsend, Greenspan & Co. believes an understanding of the dynamics operating at any point in time must be included in the thorough analysis of a model's output to determine if the results are accurately describing the current and most probable future outlook.

On the other hand, several large banks that have traditionally been reluctant to embrace "wild new ideas" have jumped on the technology bandwagon, as evidenced by their new electronic funds transfer systems, Shah said.

In addition, many other new banking products rely heavily on the latest computer technology, he added.

The Chase Manhattan Bank, for example, owns an econometric consulting company, Chase Econometrics, which uses computers extensively in forecasting.

Computer modeling has become more successful as more timely data and information on key economic and business parameters becomes available, Shah added.

Role of Data Banks

"Large-scale centralized data banks of international economic and financial data coupled with internal company data have facilitated modern econometric-based modeling," according to Dennis O'Brien, vice-president of Data Resources, Inc., a firm that provides such data.

Product line forecasting, for example, in which a company's product sales are related to the economy and also the company's internal management policy, allows "what-if" analysis of corporate strategy in response to the economy, O'Brien noted.

The impact of these new approaches to corporate planning has considerable impact on the financial management sector of a company, Maria Honczarenko of Nabisco said.

Honczarenko suggested "phased-in implementation," an approach that she said worked for Nabisco. "Initially, systems effort was concentrated on satisfying the immediate critical requirements of the divisional management coupled with some flexibility to respond to ad hoc requests and key management questions," she explained.

"As Nabisco personnel became more comfortable with the approach, the system was improved and made more complex without major redesign," she said.

Flexibility Suggested

Computer models should be more flexible so they can adapt to problems more readily, Shah suggested.

When management sciences were in their infancy, the typical application tended to put into place a particular model to solve a particular problem. This was costly and time-consuming and often produced answers that were "too little too late," he said.

Managements are now looking more favorably on ongoing planning methods that are based on new technology and improved software, according to Shah.

United Air Lines has developed a financial planning model that helps transportation managers determine the impact of schedule changes on the profitability of the company.

"The model allows managers to test proposed schedule offerings and evaluate their effect on a wide range of operating parameters," he said.

Complexity Limits Econometrics

CHICAGO – Econometric forecasting, if not constrained within certain judgmental parameters, can easily become an exercise in wishful thinking or what Paul Samuelson calls "nominating ideas."

This is because the economy, particularly that of the U.S., is a very dynamic and complex machine with a myriad of interactions and quickly changing technological and behavioral trends, Prakash A. Shah told Info '76 here last week.

No model, no matter how complex and brilliantly conceived, is capable of capturing this temperamental entity, he said.

Quantum Leap

Shah, who is director of management sciences for Time-Sharing Resources of Great Neck, N.Y., pointed out the last several years have seen a quantum leap in the direction of improved and readily available data which forms the primary input to econometricians' work.

Simultaneously, software has been refined and is now available in user-oriented form, "freeing the economist from the stranglehold of computerese."

Today, the economist is more able to communicate the dynamics of the economic system to company management in a timely manner, Shah said.

Basic Forecasting Types

There are two basic types of forecasting: long-range, which Shah described as longer than one year, and short-range, or one- to 12-month periods of time.

Those categories break down still further – into aggregate vs. detailed forecasting, according to Shah.

Aggregate planning might include such things as product groups, one plant, the entire company or the whole industry, for example, whereas detailed forecasting might consider only a single product, he explained.

Forecasting by objectives is done using management-supplied objectives – a type of forecasting typically used when there is a lack of historical data or when turning points and technological change nullifies the ability of history to predict the future.

Analysis, on the other hand, is forecasting based on the projection of historical trends and relationships into the future, Shah said.

And to Focus on Objectives

'Scenarios' Suggested to Aid Management Choices

By Nancy French
Of the CW Staff

CHICAGO – DP systems will help a corporation attain its goals only if it is focused on the company's primary objectives, James Kinney, a consultant with Cresap, McCormick and Paget, Inc. said here last week.

Speaking at an Info '76 session on DP management, Kinney said management information systems (MIS) managers must work with top management to assure DP planning is a part of the corporate planning process. Kinney suggested the scenario approach as one method that has proved helpful in establishing a dialogue with the people at the top.

Understanding Limited

Because top management has a limited understanding of MIS, including the capabilities of DP technology as applied to the business system, and even less knowledge about the specific needs of a business system in terms of DP performance, breadth and application, Kinney suggested the MIS manager develop a set of scenarios, or givens, in business – not DP – terms.

These scenarios would offer choices to management and provide it with a clear idea of the results of those choices as well as their costs, he explained.

System Description

Each scenario would describe the operation and capabilities of a proposed information system in support of a business, Kinney said. The introduction could include a description of the business including key factors such as markets, products and its important characteristics; an analysis of the business environment; and specific assumptions describing the corporation's intended participation in the business derived from the strategic objectives developed at the start of the planning process.

This introduction establishes the basis of the dialogue between the MIS manager and the company's top management, Kinney said. The remainder of the scenario describes alternative types of information system capabilities that could be established to correspond to the business development assumptions agreed to at the start of the planning process, he explained.

The scenarios can be used to determine the extent of computer-based transaction processing the new business plan will require, for example, or whether an integrated data base will be needed to support the information systems, he added.

They can also help determine the degree of computer dependency the firm's management wants to build into the business operation, he said.

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Three Givens Suggested

A future plan should be developed allowing for three sets of givens. Numbers of locations could be one variable, for example. The first might provide for three locations, the second for three plus a satellite and the third for three large locations with multiple satellites.

The second variable might be number of customers. Here, one scenario might call for 300 to 500, the second for 700 with 175 customers dealing with the satellite and the third, 1,000 to 2,000 customers, he suggested.

As for the relationship between the locations, one scenario might provide for three stand-alone warehouses, the second for a satellite warehouse drawing on a central warehouse and the third, a satellite warehouse with interwarehouse shipments.

Projected annual sales volume could be another variable that would help determine the information system needed, as would the type of order entry – from daily update or on-line inquiry and batch daily update to an on-line interactive system as the third choice.

In the area of billing and accounts receivable, three choices could be offered – weekly batch posting, weekly or daily cash posting or weekly on-line cash posting, he said.

Another variable might be annual sales volume, he added.

Inventory Control

As for inventory control, Kinney said top management could be offered a choice of daily update within each individual location, daily update of a central file or on-line real-time central file inventory control.

Finally, in the area of order scheduling, the first and second scenarios might provide for manual order scheduling while the third could provide for computer-generated order scheduling, he suggested.

Equipment Configuration

Equipment could be handled in the same manner, with the first scenario providing for stand-alone systems at each location, the second calling for a centralized system providing service to each location and the third providing for a network connecting the main warehouses with satellites operating off-line in a distributed data base system.

Cost should be calculated as part of each scenario, Kinney pointed out, so management knows it could vary from 2% to 3% of sales for the simplest system and from 5% to 7% of sales for the "Cadillac version."

Guide to Privacy Act Available

McLEAN, Va. – A 200-page guide on the technical impact of the Privacy Act of 1974 and how to comply with its requirements has been published by Systems Development Corp.

Entitled *The Privacy Act of 1974: A Reference Manual for Compliance*, the book provides an outline of the act's basic requirements and examines the technical considerations in implementing the law for automated systems of records.

It also presents an analysis of the legislative intent behind the requirement to "establish appropriate safeguards."

Copies can be purchased for $15 each from Systems Development Corp., SDC-Privacy Project, 7929 Westpark Drive, McLean, Va. 22101.

MSS Not Sparking Interest of DPers: Freeman

By Toni Wiseman
Of the CW Staff

CHICAGO – Very little has happened in the area of mass storage systems (MSS) in the last two years, attendees at Info '76 were told here last week.

While there have been some very interesting technology developments in the field, there has been little commercial interest kindled despite the large amount of time and money federal research agencies have invested, according to Dr. David N. Freeman, a senior associate of Ketron, Inc.

By 1974, six different MSS had been announced for commercial availability and there have been rumors of overseas efforts by International Computers Ltd. and Siemens.

The Ampex Terabit memory uses a large reel of video-recorded tape to store 5.5 billion bytes of data. It is interesting, Freeman noted, that Ampex has been able to exploit a product – video taping systems – developed for a very different industry.

The California Computer Products, Inc. (Calcomp) automated tape library, on the other hand, utilizes an elaborate storage and servo mechanism to automatically retrieve, mount and dismount conventional mylar tape reels, he said.

Control Data Corp.'s 38500 is based on a mylar cartridge, while Grumman's Masstape uses a mylar cassette and IBM's 3850 uses a video cartridge, he added.

Finally, Precision Instrument's System 190 offers mass storage on a coated pack strip, using a laser beam to burn microscopic holes in the Rhodium-plated strips of Mylar, which it can subsequently sense with a lower powered laser beam.

By late 1976, approximately 50 commercial MSS will have been installed.

Throughout the decade of 1966-1976, commercial interest has remained relatively low for a number of reasons, both technological and business, Freeman said.

"First of all, the rate of magnetic disk improvements has been as great as most installations could assimilate," he said. Within the decade, IBM moved from its 7M-byte 2311 drive to the 30M-byte 2314, the 200M-byte 3330-11 and finally to the 317M-byte 3350, he noted.

"Other manufacturers have matched IBM in these capacity increases which have produced an annual unit cost decrease of 15% during the decade," he added.

Magnetic tape technology has also kept competitive with disks for archiving and sequential processing functions, Freeman said. Tape densities have increased from 800 bit/in. to 1,600 bit/in. and then to 6,250 bit/in., he noted.

"Although not as dramatic as disk capacity increases, this has served to maintain tape's dominant role for archiving.

"The unit purchase price for tape reels has remained in the $12 to $20 range, whereas disk packs have typically rented for $15- to $20/mo.

"Hence, installations with large numbers of unconnected applications have used tape for private storage of files and programs due to cost considerations," he said.

Uncertain of Need

Another factor hindering the widespread use of MSS was the uncertainty of a need for a third level in the storage hierarchy, Freeman told attendees.

Many of the largest on-line installations, such as airline reservation systems, required random-access response times of three to five seconds. None of the MSS devices developed during the last decade has been able to meet this performance level, he said.

"Even today, no announced or unannounced MSS device can store 10 billion bytes on-line with the capability of retrieving any 100-byte record at random in an average of five to 10 seconds.

"The only approach furnishing this capability has been a roomful of disk drives, logically organized so that active subfiles are located on different drives," he said.

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The trend towards distributed data bases has also been a deterrent. In 1970, firms normally had three to five large computer centers containing most of the data, Freeman said.

By 1975, the trend was one or two computer centers containing summary master files with cartridges, floppy disks and cassettes furnishing reliable, fast-access local data bases at branch offices, he maintained.

"Finally, the hardware reliability of MSS devices is unknown – hence, worrisome – and adequate file organization support may be years away," he stated.

To illustrate his point, Freeman noted IBM's first commercial effort for a large-capacity, slow-access device, the 2321 data cell, had serious problems, including a low average transfer rate, uniqueness within most configurations, unreliability of the transport and read/write mechanisms and inappropriateness for data base applications because of response time.

Who needs mass storage technology today?

"Most installations requiring at least 20 billion bytes of on-line storage need MSS, while none requiring less than 5 billion bytes do," Freeman said, noting that with current disk technology, 20 spindles can satisfy a five billion byte requirement cost effectively, "although response times are much faster than are required for most applications."

In the grey area between five billion and 20 billion on-line bytes of storage, the decision to go to MSS or not depends largely on the rate of growth for the particular installation, he said.

"It is interesting to note that IBM has so far been selling 3850s primarily as replacements for magnetic tape, in particular, for libraries of a few thousand tape reels, which are active files for various applications.

"To date, few IBM installations have planned to replace many of their disk subsystems with 3850s, even though IBM's announcement and promotional literature emphasizes the reliability and cost-effectiveness of 3850s for on-line applications," Freeman said.

No Positive Reasons

Commonly, the precipitating factors for seriously considering a major change in storage devices are imminent exhaustion of computer room space or imposition of an enormous new application on an installation, he noted.

Unfortunately, he said, there do not seem to be any positive reasons for moving to MSS, neither new functions, improved system responsiveness nor improved mainframe utilization.

"Any function or response achievable with MSS devices can be more easily achieved with conventional disk subsystems," Freeman said.

As Court Action Indicates

Users, Vendors Eagerly Attacking Software Tax Laws

By Molly Upton
Of the CW Staff

If the number of lawsuits and hearings is any indication, users and vendors are becoming increasingly eager to attack the morass of state and local laws governing taxation of software and DP services.

Although many of the cases cropping up are distinct, the definition of intangible personal property – which in many states is not taxed – is the common thread.

However, the complexities arise when one considers the premises on which a state or locality is seeking to collect taxes.

In some states, work done on punched cards is considered "processing," which is taxable.

In other instances, disputes arise over the definition of "tangible" and "intangible" property and the determination of what is of substance to the user, the medium or the message.

Taxation Opponents

Opponents of software taxation have argued the data contained on various media is what is of value to them and this data is intangible.

In some states, software transmitted directly to a computer via communications is not taxed while the same software contained on magnetic tape, for instance, is taxed. That software can be transferred this way makes it intangible, they argue.

Another criterion is to equate intangible property with that which has value for a very long period of time. The arrangement of data, or "precisely scattered electrons forever," is what is of substance to the user, not the media itself, they argue.

There are reports that several states are awakening to the fact they may be sitting on a big source of revenues that can be mined by taxing software.

New York State, for example, "reinterpreted" its tax statutes recently and declared software and various DP services taxable [CW, Nov. 1].

And in Birmingham, Ala., Central Computing Services, Inc. (CCS), a subsidiary of Central Bancshares of the South, took on the State Department of Revenue and won in a lower court verdict that ruled software was intangible and not taxable.

However, the case is being appealed in the circuit court of the 10th Judicial Circuit of Alabama, according to Dewey H. Crim, CCS president.

The CCS case began when the Department of Revenue assessed CCS a retroactive use tax on its banking packages obtained from University Computing Co., Crim said. The total sought by the state for the use tax and penalties between July 1, 1971 and June 30, 1974 was $13,519.91.

CCS argued the software contained on the packs or tapes was intangible and the medium was inconsequential – the same conclusion a Tennessee court reached in The Commerce Union Bank vs. George M. Tidwell. CCS attached a copy of the Tidwell case to its brief.

The president of a DP services firm has told Florida officials that a state statute taxing software is unconstitutional. See story on Page 14.

In Statistical Tabulating Corp. vs. Bob Bullock, a case arising out of a dispute between the keypunching firm and the Texas comptroller of public accounts, an Austin, Texas, appeals court ruled keypunching is a service and is therefore exempt from Texas sales tax.

Part of the Texas sales tax ruling provided that tax can be collected when a customer furnishes, "either directly or indirectly, the materials used in the producing, fabricating, processing, printing or imprinting" processes.

The court found the only materials contributed by Statistical Tabulating's customers were "data, information and statistics which are intangible products of accounting, research or records."

Statistical Tabulating provided punched cards on which it had already paid a sales tax.

"It may not be assumed or implied that the legislature intended also to tax intangible data as materials furnished by a customer wanting the data transferred to cards suitable for computer calculations or recording," the court ruled, noting the legislature made it clear the tax should fall only on "tangible personal property."

A rehearing on the case was denied July 7.

Statistical Tabulating brought the action in June 1974, after it was assessed over $20,000 in taxes. The appeals court's ruling, which directed Statistical Tabulating to recover its taxes, reversed a judgment of the district court which had awarded the firm nothing.

Tax Credit Sought

Others are using a district court ruling in a case filed by Texas Instruments (TI) to demonstrate software is intangible.

TI filed suit against the Federal government for the right to take a tax credit on seismic data contained on magnetic tapes. But last March the District Court ruled TI was not entitled to such a tax credit because the data on the tapes was intangible.

The court held that TI's "real" investment was not in the tangible computer tapes themselves but, rather, in the seismic information which it collected.

Once collected, that information would and could not wear out," the court held.

"True, technological innovation might render the information useless, but unlike a bulldozer or a conveyor belt, the collected information would remain trapped in precisely scattered electronics forever," the court said.

TI has appealed the case.

Awards Competition Slated

CHICAGO – *Control Engineering* magazine has announced a "Call for Entries" in an awards competition designed to recognize significant energy-saving achievement by people engaged in control engineering.

The awards competition is part of *Control Engineering's* commitment to promoting energy-saving control systems in the manufacturing processes.

Awards will be given to a particular plant, factory or facility which has installed a specific control system since September 1973 that had the conservation of energy as a major design objective.

Winners will be honored at a banquet and reception here on April 12.

For further information on *Control Engineering*'s Energy Conservation Awards Program contact Alan Laduzinski at 222 S. Riverside Plaza, Chicago, Ill. 60606.

Discriminates Against 'Software Persons'

Florida Tax Statute Attacked as Unconstitutional

By Molly Upton
Of the CW Staff

MIAMI – The president of a DP service firm here believes the Florida tax statute under which personalized and customized software is taxed is both inconsistent and unconstitutional.

Last week, he presented his argument before a Divison of Administrative Hearings in an effort to have the statute voided.

The statute at issue is 12A-1.32, which Nova Computing Services, Inc. President Robert Sherrin contended is contrary to federal and state laws and was adopted in a manner that violates certain principles of the procedure.

The rule is unconstitutional because it fails to provide "software persons" equal protection under the law, he argued.

Furthermore, statutory authority is violated because the ruling contradicts Florida statute 212 which exempts "professional, insurance or personal service transactions which involve sales as inconsequential elements for which no separate charges are made," he claimed.

An expert witness for the defense indicated he thought software was a personal service and should be exempt, Sherrin said.

Software as Personal Property

The statute in dispute provides "a software package, which includes such items as instructional material, prepunched cards or programmed tapes, is construed to be tangible personal property and the entire charge, therefore, is taxable, including the services of a technician to assist the customer in the use of the package whether or not his services are separately itemized on the billing. The same ruling applies to customized program packages."

The Division of Administrative Hearings is empowered to strike all or part of the statute, Sherrin said. A ruling is expected within three months.

The case, known as Nova Computing Services, Inc. vs. Reuben O. Askew, governor, et al and Information Consultants to Management, Inc. and Isis Corp., arose when Nova was assessed taxes on some software it purchased for its Cincinnati Milacron computer.

Although Nova's principal business is contracting out keypunching jobs, Sherrin said he recognized the importance of software taxation and decided to try his own case with the aid of lawyers.

Sherrin said he has been proceeding under an administrative procedures act, which has expedited the process tremendously.

Inconsistencies Cited

It is inconsistent that software on punched cards, paper tape or paper is taxable whereas software on magnetic tape, disk or direct transmission to the computer is exempt, Sherrin claimed.

Magnetic tape is tax exempt because no change of property title occurs as tapes are usually returned after use, he said.

But, he asked, what about keypunched cards which are furnished by the customer "where clearly no change of title of property takes place"?

"Information on magnetic tape being exempt from sales tax, therefore, requires that information on any communications medium be exempted from sales tax," Nova argued.

A court reporter's paper tape also is exempt whereas a software person's paper tape is taxable, he pointed out.

The respondents, Askew and the other parties, defined software as "the data recorded in a software package which is used to enable the computer to perform specific data processing operations."

In Sherrin's opinion, the above definition includes punched cards.

Statute Conflict

Another aspect of the conflict between statutes 212 and 12A-1.32 is that 12A-1.32 results in the taxation of Florida taxpayers for alleged tangible personal property.

These same taxpayers are deprived of the Investment Tax Credit benefits and the depreciation of tangible personal property because the Federal government construes these to be intangible property, Sherrin observed.

Nova cited recent cases in Texas and Tennessee in support of its argument.

In Statistical Tabulating Corp. vs. Bob Bullock, comptroller of public accounts, the Court of Civil Appeals of Austin, Texas ruled that software utilizing cards as a communications medium is exempt from State of Texas sales tax, Sherrin said.

In Texas Instruments vs. U.S. last March, the court ruled that software data on a communications medium is intangible in nature because of its relative value and permanence, and the communications medium is an inconsequential element of intangible software.

In Tennessee, The Commerce Union Bank vs. George M. Tidwell, commissioner of revenue, exempted software from taxation [CW, Aug. 30].

"It is merely incidental that these intangibles are transmitted by way of a tangible reel of tape that is not even retained by the user," the court stated.

On procedural matters, Sherrin argued the state rule authorizing the taxation of software was adopted in an irregular manner. A Florida statute that calls for revamping Florida's state administrative procedures covers all prior proceedings and rules with few exceptions.

Hearings were held on other previously enacted laws; however, Sherrin pointed out, at no time was consideration given to the tax ruling which was passed only a few days before the administrative procedures act.

Executive Guide Offered

SAN ANTONIO, Texas – Datapoint Corp. is offering a new 20-page brochure, "An Executive Guide to Dispersed Data Processing," which describes in nontechnical language the dispersed processing concept and its significance for the business executive.

The brochure includes explanatory illustrations of functioning networks and the ways in which dispersed processing systems and peripherals can be integrated into central computer operations.

It also outlines the economic advantages and operating features of dispersed processing equipment used for data entry applications and other field office assignments.

A copy of the booklet may be obtained from the firm's Marketing Communications Department at 9725 Datapoint Drive, San Antonio, Texas 78284.

Amdahl: The Man and the Mainframer

CW Profile

By Molly Upton
Of the CW Staff

SUNNYVALE, Calif. – "There's room for more mainframers, but if too many try to enter there isn't room for anyone," Dr. Gene Amdahl said in a recent interview.

The first of the new mainframe manufacturers to offer IBM-compatible machines, Amdahl warned a shakeout, if not obliteration, could occur in the mainframe arena if vendors don't guard their profit margins to ensure future research and development.

The chairman of Amdahl Corp. and recipient of the Data Processing Management Association's Man of the Year Award also highlighted the significance to users of the growing impact of microcomputers and the increased capacity and new technologies in storage.

Concerned About R&D

Explaining why he is concerned about the profitability of the industry, the maker of the 470V/6 said "the amount of profit that can be made from the operation can't be divided many ways before there is inadequate profit in any one organization to foot the cost of development of new products."

Amdahl criticized firms that get "their share" of the business by cutting prices rather than offering a unique product.

Cutting prices "seems to benefit everybody," but if manufacturers drop prices to the point where they can't support advances in the state of the art, "it's not even in the user's interest," he said.

Vendors entering the mainframe arena must plan rationally for their future or they won't have a future – nor will their competitors. R&D has "a big price tag" and the money has to come from somewhere, Amdahl said.

Amdahl described National Semiconductor Corp. with its recently announced line of IBM-compatible CPUs to be marketed by Itel Corp. [CW, Oct. 18] as "awfully late with something that's probably a marginal product."

Distinction From Itel

Amdahl made a distinction between National Semi's and Amdahl Corp.'s approaches by saying "National is just replacing a section of the market down below where they give a little better price for the same performance.

"We are providing machines for growth the equivalent of which are not available from any other source. To a certain extent, we are contributors rather than vultures.

"But I guess we need vultures, too," he added.

Perilous But Open

The former IBM system designer ventured into the IBM-compatible CPU business despite signs that other mainframers had perilous viability because he "saw what the opportunities were, and what services weren't being provided.

"I started in the era when it was clear that RCA and GE were soon going to go out of business, and I was quite sure Xerox would too.

"But I felt they started down the wrong path in the sense they weren't serving the customer needs; they were aiming at the high revenue part of the IBM marketplace," he recalled.

"Itel's doing the same thing" by not providing anything unique but selling cheaper than IBM, he said.

"That doesn't leave you viable for any move that IBM makes" such as cutting prices or offering new products, he added.

Furthermore, Amdahl Corp. is serving a customer Amdahl indicated IBM doesn't serve well – the large user. IBM doesn't serve this user because "it's too small a market, it's not in IBM's own best interest," he explained.

Amdahl Corp. decided to make its system compatible with IBM because users have spent $200 billion on IBM systems and software since the inception of the 360, he said.

But while IBM compatibility is important, it means "we're more vulnerable. It's a high risk, but it's not as high a risk as never being able to get into the business successfully," Amdahl said.

"You have to know you can provide a customer with a continuing advantage technically over the other sources of equipment for the foreseeable future," he said.

"That doesn't mean you have to know more about technology than IBM, but you certainly must thoroughly understand what things are in IBM's best interest and what aren't because you have to understand why IBM makes the choices it does," he added.

As for the future of the company, Amdahl would not rule out the possibility of entering the storage area, although he said it "would not be anything like what is seen today and would be different in more ways than one normally thinks about."

Looking at the changing DP environment, Amdahl said the greatest revolution will come from microcomputers.

Economic Factors

The economic factors that mitigated against applying computers to such functions as input tasks and local control aspects are no longer a stumbling block. For instance, he said, it may be economically feasible to make a microcomputer-based gas pump meter that "does a few little extra things and more than pays for itself. The things you're going to see coming into the fold of DP are going to come from areas where we never even thought about using it before."

"And that's going to be revolutionary, although it will be done by people who largely are not what we think of as computer people today," Amdahl predicted.

"The other principle technology I think is going to make an impact is the technology that is going to allow us to replace rotating electromechanical peripheral storage devices by electronic storage, whether they are magnetic bubbles or electron beam addressable memories or however it's done. That will have to be the next major revolution.

"That will affect the whole spectrum of machines from small to large," he said.

"More memory is going to be the biggest impacting factor of all in large machines," he said. Technology advances will make possible enormous memories at costs comparable to those paid today for much more modest memories.

"People will use enormous memories, and will end up being able to do things much more effectively," he said. This quantitative change will actually produce a qualitative change in the way data processing is done, he said.

McCracken 'Very Concerned'

Vacuum Seen for Top Business DPers

By Edward J. Bride
Of the CW Staff

HOUSTON – "There is essentially a vacuum where some professional societies should be meeting the professional needs of senior business DP people," according to Dan McCracken, vice-president of the Association for Computing Machinery (ACM).

At a recent meeting of ACM's Special Interest Group on Business Data Processing (SigBDP), McCracken said he was "very concerned about the absence of any organization that does a really good job of meeting the needs of the senior technical people in business data processing."

There are "many thousands of DPers who are simply drifting professionally because no organization so far recognizes their needs and meets them," he said.

The Data Processing Management Association is oriented toward "present and aspiring managers" rather than senior technical people; the Association for Systems Management is geared for systems work, he observed.

"And ACM, which serves the needs of many groups superbly, does rather little in the business data processing area," he said.

SigBDP has done an "impressive and commendable job" in organizing relevant sessions at various annual meetings, he continued, but this effort "does not meet the total need" and "there is not much more you can do in that direction."

McCracken encouraged the group to improve its publication, *Data Base*, and to help stimulate and form new special interest groups.

Societies/ User Groups

Employment Opportunity

ATLANTA – An employment register will be featured at the Association for Computing Machinery's Computer Science Conference here Jan. 31 through Feb. 2 to help match computer scientists and DP specialists with potential employers.

DPers who wish to be included in the register must complete a form giving information on education, experience, publications, interests, references and position and salary desired. Anonymous forms will be accepted.

Employers must complete a similar form with information on positions available, starting dates, salary and benefits and requirements for employment.

The fee to job applicants is $5; student applications are free. The fee for employers is $20. The forms are available from Orrin E. Taulbee, Department of Computer Science, University of Pittsburgh, Pittsburgh, Pa. 15260.

Call for Papers

FOURTH ANNUAL CONFERENCE ON COMPUTER GRAPHICS AND INTERACTIVE TECHNIQUES, July 20-22, San Jose, Calif.

The conference, sponsored by the Association for Computing Machinery's Special Interest Group for Computer Graphics, will focus on computer graphics and interactive techniques. Papers are solicited on graphical theory, techniques, applications and education.

A short abstract is requested by Dec. 1 and should be sent to James E. George, Los Alamos Scientific Laboratory, P.O. Box 1663, MS 272, Los Alamos, N.M. 87545.

SUMMER COMPUTER SIMULATION CONFERENCE, July 18-20, Chicago.

The conference theme is "Simulation — A National Resource." Papers are requested on simulation methodology, hybrid systems, chemical sciences, physical sciences, environmental sciences, biological systems, managerial and social sciences, simulation credibility, energy, system engineering and simulation for training.

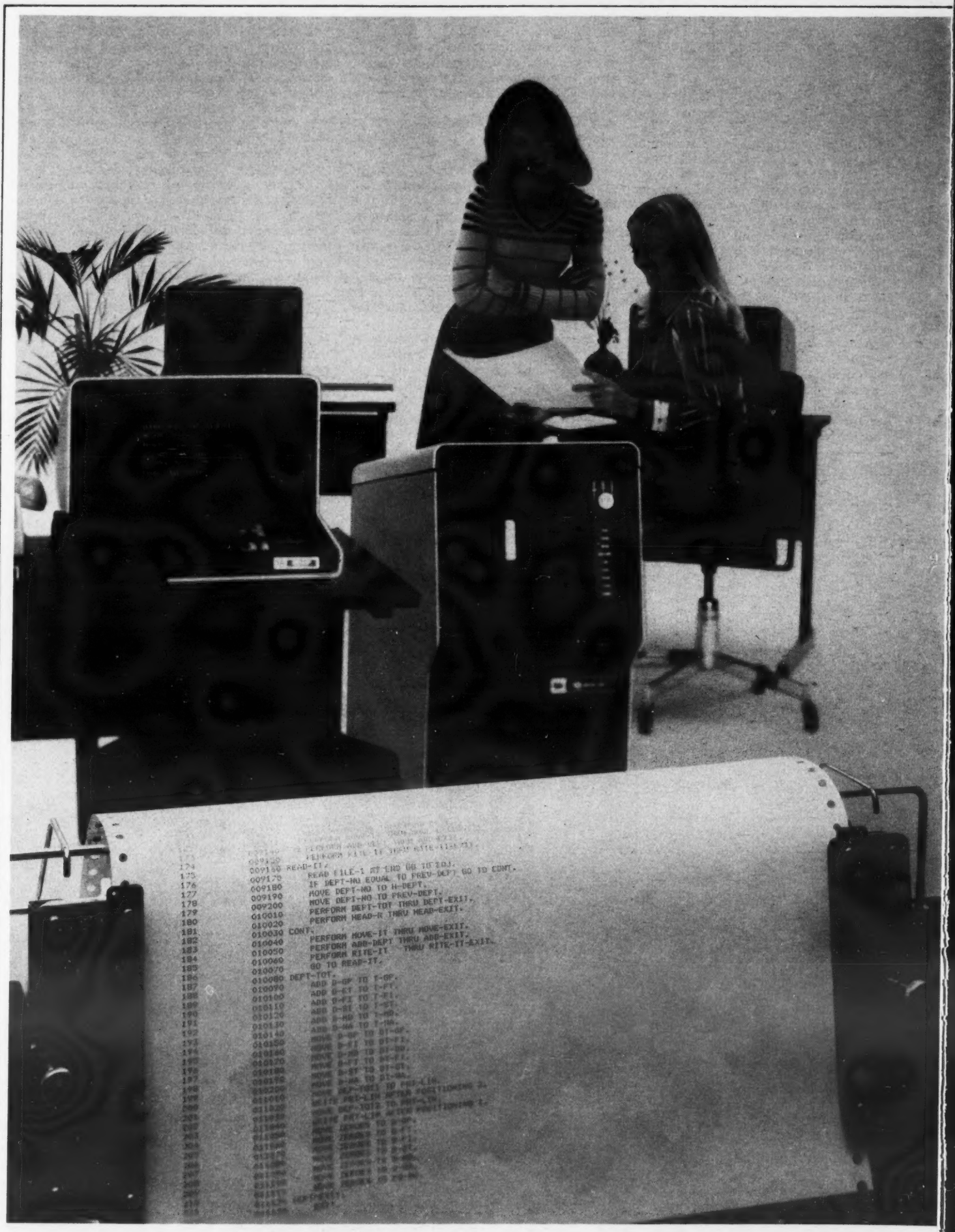
Three- to five-page summaries should be mailed by Dec. 15 to Dr. O.J. Manci, Vought Corp., P.O. Box 5907, Dallas, Texas 75222.

SYMPOSIUM ON MACHINE PROCESSING OF REMOTELY SENSED DATA, June 21-23, West Lafayette, Ind.

The symposium will focus on the theory, implementation and applications of machine processing for remotely sensed data. The program will be designed to provide an opportunity for researchers in scene analysis, DP and utilization to discuss current research results, new technological developments and new application of existing processing techniques.

Authors wishing to contribute long papers must submit a 1,000-word summary by Dec. 31. Short papers describing recent results will be selected on the basis of a one-page abstract due by March 18.

Both should be sent to Dr. John C. Lindenlaub, Laboratory for Applications of Remote Sensing, Purdue University, 1220 Potter Drive, W. Lafayette, Ind. 47906.



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Computerworld 11-1

Thanks to Training Center

Disabled People Enter Job Market as Programmers

BERKELEY, Calif. – Disabled people have entered the job market in the Bay Area as computer programmers, thanks to the comprehensive Computer Training Program of the Center for Independent Living (CIL) here.

Despite severe physical disabilities ranging from deafness and blindness to near total paralysis, more than half of the 12 who graduated from the course three weeks ago have been placed in jobs with such firms as IBM, Bank of America and Lockheed Electronics Co., according to CIL spokeswoman.

The center's training program was conceived in 1974 by IBM as the first nonresidential computer programming course in the U.S.

Funded by the California Department of Rehabilitation, the program gets technical expertise from local users and vendors, she said.

CIL's programming students use everything from sign language with interpreters to wheelchairs to complete 800 hours of programming training. In addition, the students receive on-site job experience and also learn how to live independently, she noted.

Students start out with Basic, which serves as the introduction to computers and DP, she said. They then move on to Cobol, Assembler Language, Job Control Language and a course on debugging, with the one week of job experience coming as a final portion of the studies.

Innovative, Successful Program

IBM, which "keeps close tabs on the program" in its advisory role, has recognized the project as "one of the most innovative and successful of the programs with which it has been associated," according to the spokeswoman.

The project also has a Business Advisory Board, representing more than 40 firms, including Del Monte, Bank of America, Arthur Anderson and Fireman's Fund.

Most of the state funds go to the program itself in the form of computer time and direct interfacing with computer systems, including a Control Data Corp. 6400, an IBM 370/158 and two minicomputers, she said.

'Have the Edge'

Since many of the students are handicapped to a great extent and did not attend public schools in many cases, CIL's standards are not as high as other, more formal schools and colleges, she said.

The students, however, "have the edge" over high school graduates, for example, because businesses would rather hire the program graduates than hire inexperienced people and train them from scratch, she said.

One of the center's continuing tasks, the spokeswoman declared, is educating business people right along with the program in an attempt to change attitudes about the severely disabled.

There is a problem, however, in that businesses which don't want the handicapped program graduates will find some other, legal means to avoid having to hire them, if they so wish.

Still, out of the seven students who graduated last year's course, all seven were placed and are still employed, she noted.

Computer training is one of more than 45 projects and services offered by CIL. The organization has become a principal national advocate for the expanding rights and opportunities of disabled people, she said.

Editorials

EFT - Let's Slow Down

"Privacy: That's what freedom is all about. Any time a good deal of information is concentrated in one place, it constitutes a potential threat." Paul Armer, consultant.

"The key issue in the electronic funds transfer controversy is a need for a more efficient method for transfer of money to replace the two tons of paper that is used daily now." David Huemer, National BankAmericard.

Those two speakers recently presented clear-cut differences of opinion about the most important issues in the further development of electronic funds transfer (EFT) systems [CW, Nov. 8].

The differences are clear: The people in the banking and bank card industries see EFT systems as a method of increasing their internal efficiency, leading to higher profits. The opponents see the broad social and moral issues raised by such developments.

It is clearly easier to quantify and, therefore, study the economics of EFT systems than it is to really delve into the social and political questions raised by such systems, but those thornier questions must be considered before the U.S. rushes headlong into EFT development efforts.

No one will argue EFT does not mean real savings to banks, credit institutions and others involved in providing financial services. That question does not deserve any more study.

But just because such savings are possible and demonstrable does not mean we should pursue the development of the systems.

Many things may be more efficient than present ways of doing business, but efficiency should not be the only criterion on which technological developments are judged.

Such developments as EFT systems may well affect the freedom and concomitant right to privacy of American citizens – and all the security measures in the world might not be able to protect that freedom and privacy.

Unfortunately, much of the talk today in favor of EFT concentrates on the economic advantages of the systems and possible "Band-Aid" types of security measures.

Very little attacks the underlying issue: Is it consistent with the right to privacy to collect all information about an individual's financial affairs – from what he buys to where and when and for how much – in one place?

Until that question can be answered satisfactorily, Congress should place a moratorium on all EFT experiments.

Efficiency cannot be the watchword when basic human rights are at stake.

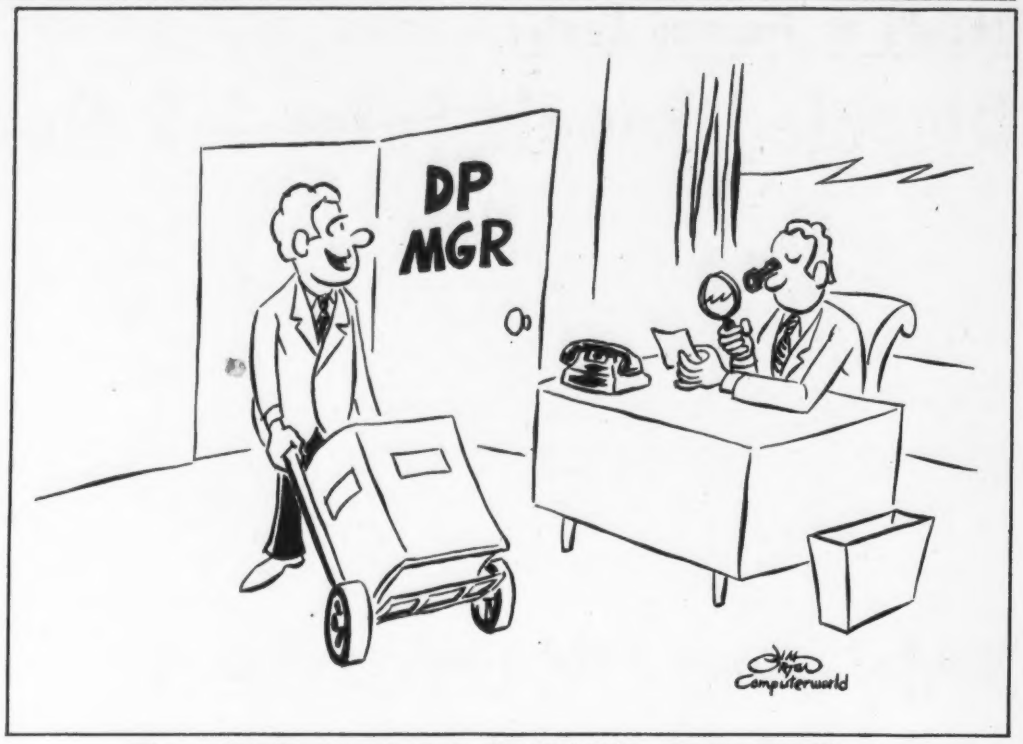
Computer Voting Comes of Age

Apparently, there were few problems with computer-based vote counting systems during the recent national elections [CW, Nov. 8], indicating this form of ballot tabulating has finally matured into a useful technology.

During earlier elections, problems that plagued the systems – from wet cards that could not be read to "mysterious holes" in the cards – made people distrust the systems and gave the entire computer field a black eye.

But this year's smooth show should put some of those worries to rest, although constant vigilance is needed to make sure the systems work as advertised.

But for this go-round, everyone involved in making, programming and operating the automated voting systems deserves congratulations.



'There's Not Much to the Code, But Wait'll You See the Test Plan.'

Letters to the Editor

No Quarrel With Substance, But Title Lacks Objectivity

Although I find no quarrel with the substance of "Contracting With IBM May Be Cheaper in Short Run" [CW, Nov. 1], I do wish to comment on the lack of professional objectivity in the selection of its title. To illustrate, the article could have been titled "Contracting With Itel May Be Cheaper in the Medium to Long Run."

This article implied it would probably be customary for a computer user to change his CPU every two to three years. I believe careful research will substantiate the fact that more and more users are retaining CPUs for at least three years. This is especially true in the public sector.

As a recent purchaser of an Itel Corp. AS/5-3 computer, Miami-Dade Community College underwent a thorough investigation of price/performance, life expectancies and residual values before making the Itel decision.

Phil Nicely
Dean of Systems, Planning and Research
Miami-Dade Community College
Miami, Fla.

Assumptions Lack Support

James H. Conole's article, "Contracting With IBM May Be Cheaper In Short Run," purported to show "hidden costs" could make a non-IBM system lose its price/performance advantage over the IBM equivalent.

Throughout his analysis, Conole made assumptions concerning the value of 158s and 168s when shipment of the next IBM generation begins, the list price of the Itel Corp. AS/5, the cost of capital to purchase the system, the residual value of the Itel equipment and the total cost to the user purchasing a system.

Conole chose to prove his argument with Itel AS/5 prices, which haven't even been released yet. Why didn't he use the cost of an Amdahl Corp. 470V/6 in comparison with a 370/168? After all, the price of the Amdahl has been published and systems have been installed.

Conole stated his analysis keyed on assumptions of the residual worth of the computers and he seemed to be counting on a "quantum drop" in value of all computer systems when the next generation of IBM systems is shipped.

In any analysis, the number and significance of assumptions should be kept to a minimum. Until more of the facts can be ascertained, I would say the conclusions of this analysis are highly debatable.

Russell Thorstenberg Jr.
Houston, Texas

Sad to See Him Go

I would like to express my dismay at the discontinuance of Herb Grosch's "Black Hat/White Hat" column. I must say that I have shared the misgivings of other readers about Herb's insistence on becoming personally involved in many of his stories.

However, much of the time Herb's pieces were worth reading not only because of what he said – witness the perceptive reports dealing with the foreign computer scene – but also because of how he said it.

Gerard Salton
Ithaca, N.Y.

Data Past

Five Years Ago
Nov. 17, 1971

NEW YORK – Univac introduced its medium-scale disk-oriented 9700, stressing IBM compatibility and a high price/performance ratio. The largest member of the 9000 family, the 9700 was described as offering users performance three to five times more powerful than the 9400 (previously the largest 9000 series model) and more than twice that of the IBM 360/50 at prices below those of the 370/145 for long-term leased and purchased systems.

– – –

LAS VEGAS – A study released at the Fall Joint Computer Conference revealed over half of the public felt people were too dependent on computers and computers have eliminated more jobs than they created. The study was cosponsored by the American Federation of Information Processing Societies, the conference sponsor, and *Time* magazine.

Eight Years Ago
Nov. 13, 1968

WASHINGTON, D.C. – The Federal Communications Commission (FCC) granted AT&T's request to delay the implementation of tariffs permitting the attachment of customer-owned devices to the public telephone system from Nov. 1 to Jan. 1. The FCC said the delay was granted to allow more time to consider AT&T revisions to the proposed tariffs it filed with the FCC in September 1968.

– – –

ATLANTIC CITY, N.J. – A joint Share/Guide Cobol Project group delivered a formal protest to IBM opposing the company's plan to phase out compiler and object program support for Cobol F on the IBM 360. The action was in marked contrast to the group's passive response a year earlier, when IBM announced it was restricting its support of its Cobol and Fortran compilers.

Production Control Works Better

Software Physics' Value Small in DP Management

By Melvin J. Strauss
Special to Computerworld

Much has been written lately about software physics – that it provides better insight into, perhaps even a definition of, the DP capacity management function.

We at Chase Manhattan Bank do not believe this to be the case.

While it is true that software physics has done much to publicize the concept of vector analysis of computer utilization, it is of minimal value in data center management – its scope is too narrow and its powers are primarily limited to describing (or forecasting future) system utilization as a multivariable vector (Kiviat graph) or as a composite (software work).

Its method of articulating is not conducive to communication with senior, often non-DP managers. They are concerned with the economic and financial aspects of operating a business and have little time or desire to learn to communicate with us in our jargon.

Management expects us to maintain strong control over our segment of the production process and to communicate our problems quickly and in language it can immediately understand and to which it can relate.

Software physics fails to recognize that control over a data center encompasses three factors: management of demand, management of capacity and management of the perception of performance.

These categories are generic to any production process, not just DP. Hence, no special allegories to natural physics are required for DP – they are not required elsewhere.

More and more each year, DP professionals have been recognizing the need for tools to address data center control problems, but they have been frustrated by lack of agreement on terms, difficulties in applying established industrial engineering techniques used for the last 50 years in other types of production processes and by communications problems with non-DP management.

Prior to software physics, this phenomenon gave rise to the development of hardware and software monitors, simulators and various accounting packages. Each of these has its place but, because of their combined limited scope, none solves the basic problems.

Management of demand addresses the quantification and control of user requests. Software physics attempts to address one of these topics, quantification. It imposes uniform structure in various resource needs – CPU, core, tape, etc.

This structure provides a useful vehicle for estimating increased resource requirements as a result of volume increases and new applications, but is not applicable to day-to-day operations. Computer operators complain to their managers about shortages of tape drives, disk drives and printers, but rarely do they become concerned about the number of EXCPs they process.

Similar statements can be made regarding CPU and core requirements. Operators rarely believe they have processed an excessive number of bytes, but they recognize when they do not have sufficient core.

Data center loading, then, should be expressed in terms of those things operations must allocate or reserve for an application. This is the only structure to which operating staffs can relate.

The difference between this philosophy and software physics is marked. Consider the on-line job which alone accounts for 50% of the allocation of all disk drives but only 5% of all disk-related EXCPs or "disk work." Is this job responsible for major or only minor disk demand?

Software physics would calculate this as a minor percent of all disk work. Most managers would consider it major.

Furthermore, software physics relates only to quantifying utilization. It does not address the much more critical issue of control.

Management of demand, at least in every other processing industry, requires understanding and controlling the difference between utilization and demand. Software physics does not directly recognize this difference.

Demand, in DP, can be exemplified by requests by some user, for example, for 25% CPU between 3 a.m. and 4 a.m. Utilization relates to actually running the job, for example, 30% CPU between 3:30 and 4:30 last night.

Management by Default

When utilization closely approximates demand, management of demand occurs by default. But this approximation rarely occurs in most shops. Usually jobs start and finish late, take widely varying amounts of resources and run more frequently than expected.

This results in accusations by users, often unjustified, that DP service is poor and is reflected in the inability of operations managers to state how they plan to service particular jobs.

These problems have been solved outside software physics. At Chase, each application (consisting of several jobs) is covered by a service agreement between computer operations and the appropriate user area. The service agreement, or contract, is a very simple (but detailed) tool which documents specific user commitments to provide timely, error-free input; specific computer operations commitments to meet stated user deadlines; and, where appropriate, specific resource requirements of individual jobs and the associated expected in-

(Continued on Page 22)

Reader Commentary

Consider Chrysler Corp.'s Process

Would You Make a Good Tester of Test Systems?

The Taylor Report
By
Alan Taylor, CDP

The question of how computers and programs are tested got a new twist this year which may bring more understanding about the current lack of precision testing of programs in our DP shops.

These tests were designed by people who manufacture test systems and diagnostic equipment down in Huntsville, Ala., where the commercial art of testing has a long history.

Let's take a look at what they came up with when Chrysler Corp. wanted to test the computers and programs that would in turn test lean burn engines in a mass production environment.

The product being tested is a Spark Advance computer which is made up of some 200 functioning parts including subassemblies of programs. The solid-state parts are applied to the subassemblies before everything is joined with a vacuum transducer into a single unit near the end of the production line.

Testing During Assembly

During the assembly operation there are three tests. The first test sequence is simply a check on whether the circuit boards have been properly connected to the capacitors, connectors, etc. and whether the board itself meets specifications. The test is computer-controlled both for the purpose of spotting problems and for describing them to the repair areas.

The second test is a 185°F environmental test in which the program subassemblies are checked out before being potted in blue silicone compound. After this test, the whole is melded into a unit and the newly assembled computer is ready for the final computerized checkout (but not the final test – that comes later).

In the whole-computer test, the lean burn engine's performance, speed and other characteristics which are sensed by the computer are simulated; a computer prints the test results on a video screen, including diagnostic suggestions relating to failure ideas.

When this test is over, there is still another one at 185° before the computers are labeled and prepared for shipment to the assembly plants.

After this, many people would think the testing was completed. Chrysler, however, does not think so. The finally approved computers are now brought into audit and 10 of them are rechecked for proper operation.

Audit – not testing – provides the final quality control rating of the outgoing product.

This testing regime is necessary in order to have tough quality control standards for the electronic lean burn engine because of the critical role of the computer in matching the government's emission standards, according to Arthur E. Douyard, general manager of the Huntsville Electronics Division. The success of the system in permitting cars to operate without catalytic converters, using either leaded or unleaded fuel, is its raison d'etre, and failure to catch cases where this is not successful could be serious.

Questions Raised

So much for the mechanics of the testing system, which is certainly an intricate one. Most of us, however, are not going into mass production of even program subassemblies.

What can be learned from the Chrysler operation? Are the tests unnecessary? Would it be possible to do without the first or second environmental test, for example?

Are the programs adequately tested in the simulation process? Indeed, are they tested at all? What is the testing really showing – that a program will match up with the requirements of the federal emission standards when the car is new? Or that it will continue to operate properly for some years?

All these questions are pertinent if we are to understand and profit from the advantages and problems of the testing system.

But these must wait at the moment. The system of testing and the system of the actual operation of the computer programs is sufficiently unusual that the accompanying diagrams may give a much better description than any words can.

Take a look at them – and consider for yourself whether the testing is inadequate or overadequate and what results at various levels would either justify or change the levels of testing.

Then consider whether you are carrying out the principles you are instinctively adopting.

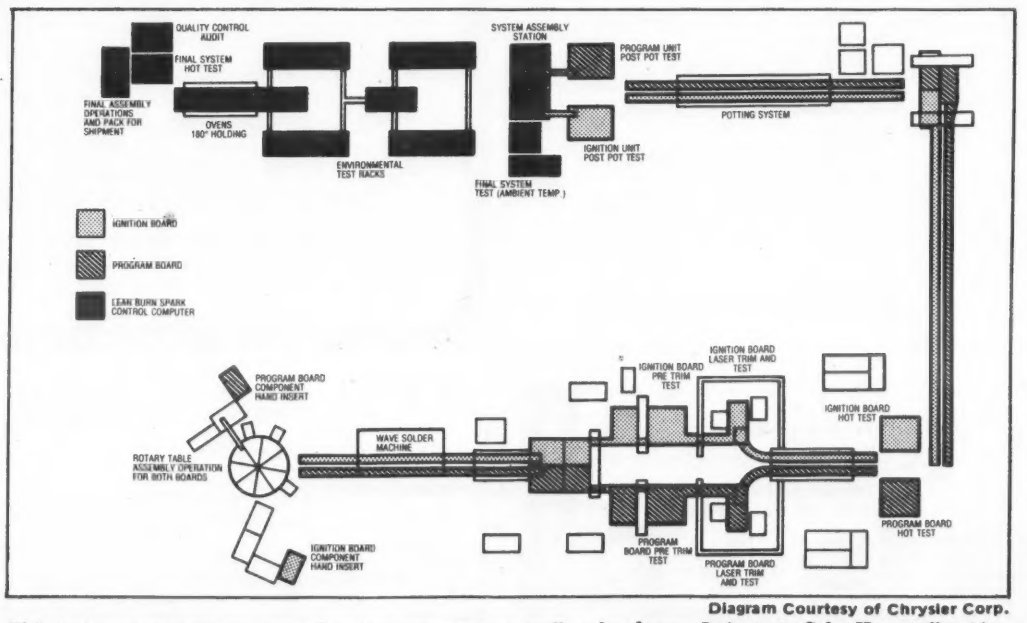


Diagram Courtesy of Chrysler Corp.

This test system segment is used to test programs as well as hardware. It is part of the Huntsville, Ala., operation of Chrysler Corp.

Software Physics Has Small Value in Data Center

(Continued from Page 21)

put volumes.

User violations of input timeliness, quality or volume release computer operations from absolute responsibility to meet the contracted output deadlines. Demand is then processed on a "best efforts" basis.

This procedure forces the user to provide better service to DP operations. He must structure his data preparation operation more carefully and is forced to recognize precisely who is responsible for late computer output.

The signatures of key senior members of both DP and user management on the contract ensures each party will abide by the contract.

Management of Capacity

Management of capacity involves more than just striving for colining circles on a Kiviat graph or balancing EXCP traffic across channels. When production costs are taken into account, it encompasses manual support of computer processing and demand constraints more than hardware load balancing.

System monitors, simulators, and equations that liken Newton's Third Law to the output of an IBM 3 are all valuable and have their place in our repertoire of tools, but they do not identify many of a shop's major operating constraints and, therefore, their exclusive use would not focus on the real problems.

We presented a description of these constraints in *Computerworld* nearly two years ago. To summarize, constraints upon capacity usage fall into two categories: those that are a function of demand and those related to operational ineffectiveness.

Demand constraints result from applications being different sizes. A mix of jobs may saturate one component such as tape drives, but not all CPU cycles will be required. Keeping output deadlines in mind, if all other applications waiting to be run use a tape, the remaining CPU cycles are unusable.

Application interdependencies amplify this effect. Operational effectiveness constraints include system downtime, data problems and operator errors.

By keeping records of the occurrences of these constraints, one can simulate the effect on output timeliness and quantify service risk as a function of computer loading. Restated, it is possible to guarantee 90% timeliness 95% of the time by planning to load a system no more than, say, 62% of capacity.

We at Chase are completing our third year of commitment to this methodology by signing yearly performance contracts with our senior management as well as contracts with our users.

Software physics does not provide this technology.

Importance of Communication

The perception by senior management of a data center's performance can be only as good as the data center's ability to communicate with that group. One cannot expect many corporate heads to appreciate a 10% increase in "software work" when users complain of poor service.

Nor do they understand altering bytes. It sounds more like something a dentist does, not a data center. Moreover, bytes are not directly identifiable with major corporate processes or products.

Communications with senior managers must be on their terms. Once the capacity level-service risk concept is understood, performance should be reported to them in terms of service maintained, demand as a percent of capacity, effectiveness and unit production cost.

These factors – demand management, capacity management, and performance perception – are key. I have not discussed costing and its relationship to the demand-utilization issue. I have not discussed how additions to SMF-type data reduction can help an operation identify and then quantify its effectiveness problems.

And I have not discussed how simple reliability calculations can improve user service by reducing equipment and costs. These are all basic production control techniques already used in other industries.

It was once forecast that DP professionals would inherit corporate leadership; it is painfully obvious this is not happening. Perhaps our problem is that we are speaking the wrong language, promoting the wrong things.

Our failure is one of scope and articulation. Software physics will not address this issue. Production control already has.

Strauss is a second vice-president and manager of Chase Manhattan Bank's Computer Production Planning and Measurement Department in New York City.

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With No Meaning to Management

Software Physics Not Relevant Outside DP World

By Vincent J. Bannan
Special to Computerworld

Michael F. Morris' recent challenge concerning software physics [CW, Oct. 18] went one step further in adding to my confusion on this subject.

I really don't know why I should be confused because I have been associated with mathematical statistics, physics and computer performance for many years. But I continue to be turned off by this whole quest for the Holy Grail.

I guess the best way to express my feelings is to imagine the same kind of controversy swirling around a small trucking and freight dispatching firm. Sometimes I think of computer operations in this analogy:

The company has five large tractor trailers. The firm's operations manager is constantly under stress – how to give service to his customers? How to keep costs down? How to meet shipping requirements? Rating problems.

The president of the company continues to ask him, "What is the capacity of our five trucks?"

"What do you mean?" the manager asks.

"Well, will we be able to meet deliveries in six months or a year, or do we need to buy another truck or different trucks?" the president replies.

The manager tries to find the answer. He goes to meetings where he commiserates with other managers of small trucking companies who also have this problem. Together they talk a lot, drink a lot and learn very little.

Suddenly, he reads in a trade journal about a new theory that is going to solve his problems. What it seems to be able to do is to tell him how to calculate the horsepower rating of his trucks.

It will tell him how trucking power can be calculated as a vector quantity so he will know what the maximum speed a truck can travel with a given load, on a given highway, at a 20% grade.

If he examines a given shipping requirement by weighing it and measuring it and calculating the distance from his warehouse to the point of destination, he can figure out its vector demand.

This sounds very scientific except that the real problems facing the operations manager are that he cannot run his trucks all of the time, they can't go in all directions and other restraints are much more overpowering than the horsepower ratings of the motors.

Management wants same-day delivery. Because of time requirements, shipments must go with less than truckload quantity. Speed limits prohibit maximum speed, which contributes to his problems. Safety regulations add to it.

Moreover, demand is not evenly spread over the 30 days of the month. The peaks in the first four or five days aggravate his production plans.

Somehow knowing the horsepower rating of his trucks doesn't seem relevant.

With this analogy, I am certainly exaggerating and oversimplifying in some respects. My point is that, when the president of the trucking company asks about the capacity of the trucks, he is really asking about their capacity to serve his company's demands, not their capacity to transport things in abstract.

The president of a company who asks about the capacity of his computer is really asking about its capacity to do required production tasks like payroll, accounts receivable or sales statistics within the accepted policy and time restraints. To answer him in terms of the capacity of the machine to transfer bits or to change and replace them or to provide units of software work is not relevant to the question at hand.

When a policy is made that the orders received today are to be invoiced today, how does one reflect that in terms of software work?

Even a casual reader knows it may require more capacity to do that than to allow invoices to be produced in a catch-as-catch-can manner. When management of a bank demands that checks get to the clearinghouse by certain times, these requirements tax the capacity of the computer; in terms of software work, however, they have not changed the vector quantities. One must begin looking at the concatenation of these vector quantities on a detailed time axis.

Reader Commentary

These remarks are not meant to reflect negatively on the good positive analysis that software physics is researching. They are only my reaction and echo the reaction of many people in the industry with whom I have discussed this topic.

I just don't understand the relevance of software physics outside the technician's world. It might be a vehicle of communication among technicians, but I miss its meaning to management.

Until we address these kinds of problems, I think we are being unnecessarily precise in answering a question that very few people have.

Bannan is president of Value Computing, Inc.

'Oh, That. It Figures Out the Change.'

Software Industry's Viability Not in Question Today

By John R. Bennett
Special to Computerworld

We at Applied Data Research, Inc. (ADR) read with interest "IBM Couldn't Pinpoint Software Industry's Vitality" and "Software Predictions Off?" [CW, Sept. 27].

These stories covered IBM's 1970 estimate of the viability and potential of the software industry as well as its evaluation of five software companies (ADR, Computer Sciences Corp., Computer Applications, Inc., Computer Usage Co. and Computing and Software, Inc.).

Many of the points covered in *Computerworld's* review of the IBM report were certainly perceptive and accurate: Since 1970, many software companies have not survived; the unbundling announcement did not bring about an immediate bonanza for software companies; many software companies were not marketing-oriented; software products had heavy initial investment and long-term payouts, many companies lacked experienced management; and the need for a manufacturers documentation did necessitate a delay before others could develop a complementary or competitive product.

IBM was eventually proven wrong in the one all important area – the autobuying syndrome. This was its belief that there would be a tendency to buy software from one source, such as the mainframe manufacturers.

Today, when there is the opportunity for users to compare two software products competitively – one from an independent software company and one from a computer manufacturer (i.e. IBM) – the independents are winning more often.

These gains in the marketplace are a result of the overall quality of the independents' software products including their facilities, efficiency, documentation, reliability and support.

Datapro supported that conclusion in its 1975 report on IBM vs. non-IBM software products. The report found that in the overall categories of satisfaction, throughput/efficiency, ease of installation, ease of use, documentation and vendor support, independent software companies' products were rated significantly higher than IBM's products.

Reader Commentary

The IBM report did not state many software companies are financially motivated to produce the best software possible. Today, software companies are attracting some of the best people in the industry; they are doing a superb job of marketing and supporting their products; and, finally, they are becoming specialists, which makes them formidable competitors of IBM.

This competition is good for the user – such competition has stimulated rapid innovation in software product technology.

As for ADR, the report said its 1970 product line was limited. And it was at that time. But today ADR has seven systems software products as well as a line of hardware/software products for the telephone industry.

ADR has increased its software product revenues since 1970 by over 350%. ADR has accumulated software product sales well over $40 million and grosses almost $10 million in annual software product sales.

ADR has a strong and stable technical and field marketing force and has over 5,000 products installed. We do business in over 30 countries and have very handsome profits from our software product sales.

But ADR is but one of many companies in the software products industry which has grown since 1970 and expects to have a healthy continued growth in forthcoming years. IBM may have been right in 1970 when it questioned whether a software industry was viable at that time; however, there is no question today concerning the industry's viability.

This is evidenced by the fact that software product companies will reach sales of $1 billion in the near future and that users are becoming more appreciative of the value of independent software companies and of their contribution to the development of quality software products.

Bennett is president of ADR.

'Those Computer Operators Are Always in Here Unwinding and Reloading.'

One of First 'Easyspace' Users

Chemical Maker Finds Three Benefits With Package

PHILLIPSBURG, N.J. – What user wouldn't want to increase multiprogramming, reduce disk mounting and swapping and reduce computer work area requirements by one-third?

That's what the J.T. Baker Chemical Co. here did after it became one of the first users to acquire the Easyspace software program from Value Computing, Inc.

A manufacturer and distributor of chemical products for industrial and laboratory use, J.T. Baker maintains an Information Services Department staffed with 20 people. Its computer configuration consists of an IBM 370/125 with 256K and four 3330s.

Conventionally, the department runs four partitions – one on-line, one power VS and two batch. The gamut of jobs assigned to the department includes order processing, order releasing, product planning and scheduling, sales and marketing support and all general accounting functions with the exception of payroll.

"Searching for better ways to enhance the effectiveness of your capability is a continuous responsibility," according to Paul Zaboy, supervisor of technical services and computer operations. "It was this search that led us to install Easyspace.

"We were experiencing the familiar problem of setting up jobs in multiple partitions and were locked into a situation where the jobstream had to be allocated to one partition," he recalled. "We figured there had to be a better and more cost-effective way."

Designed for use in an IBM DOS/VS environment on a 370, Easyspace allows runtime allocation of scratch disk work space from a pool of available space. It was also designed to afford increased multiprogramming, reduction of disk mounting and swapping, simplification of JCL requirements, reduction of hardware requirements and the ability to change from one direct access device type to another, Zaboy said.

"The program gives us a pool of available work space we did not have before," he continued. "And it gives us better control of work space so we can maximize our use of space.

Space Requirements Cut

"The result is that we have cut our work space requirements by one-third while we have significantly increased our throughput. Instead of dedicating the jobstream to just one partition, as we had to do before, we can now allocate it to any partition. This is the kind of flexibility that translates into real production gains."

Before installing Easyspace, the Information Services Department had to plan and allocate work space in advance in order to avoid scheduling problems and the kind of overlap that can shut down the computer. Now two or more jobs no longer attempt to use the same work space.

Since Easyspace makes the scratch disk files partition-unique, conflicting assignments are automatically eliminated.

"The important thing is that we have improved the performance of our computer and its ability to effectively carry out the tasks assigned to it," Zaboy concluded. "And we have gained this additional effectiveness without making any changes in our operating system environment."

'Autoref' Cross-References Cobol Relationships

SANTA CLARA, Calif. – The Autoref package from Siegal Associates was designed to help IBM or Burroughs users understand how their existing Cobol software "fits together" and perhaps how the fit could be improved, the vendor said.

Operating in nonvirtual IBM environments or with Burroughs medium-sized CPUs, the package uses Cobol source statement libraries as input. From these, it generates a series of cross-reference reports showing the relationships between the user's source programs and copied members, called subroutines and referenced data names.

Cross-reference listings are often supplied with Cobol compilers, but Autoref goes further by listing the interrelationships between programs and even between systems, Siegal said.

With such a broad view, users can evaluate the potential of a change in a data field, for example, before making the change, a spokesman added.

Parameter cards tailor each run to the user's immediate needs. In one instance, the field of interest might be federal withholding tax while in the next run the focus could be on gross profits, the company suggested.

In cases where the same basic data name is used for more than one purpose, the control card may be used to qualify which field is of interest by defining which files it comes from, Siegal noted.

The package needs "something like 64K" bytes of memory. Users should specify which version – IBM DOS or OS or Burroughs – is required, Siegal said.

A 99-year license for use of the package is $3,000, but monthly payment plans are also available, the vendor said from Suite 112, 3000 Scott Blvd., Santa Clara, Calif. 95050.

'Jars' Gets CICS/VS Interface

McLEAN, Va. – A CICS/VS Accounting Interface Option, recently announced by Johnson Systems, Inc. for use with its Job Accounting Report Systems (Jars), is said to "significantly enhance" a user's performance analysis capabilities.

Designed to meet the accounting and billing requirements of a DP manager, the Jars add-on uses no CICS exits, needs no CICS source code modifications and does not require an installation to have IBM's CICS/VS Performance Analyzer II package, Johnson claimed.

The Johnson option provides "a majority of the data elements" of IBM's Performance Analyzer as well as some additional data from within CICS not available through the IBM package. A unique feature of the interface, the vendor claimed, is its ability to provide CPU time segregated by application program and CICS overhead.

The data taken from inside CICS and not available through IBM's analytical tools includes total Data Language/One (DL/1) counts for each transaction by type of call; accounting data by application program and file as well as by transaction; and additional tagging data such as the use of the complete name fields for accounting purposes, Johnson said.

The CICS/VS interface permits the use of basic time interval or transaction count logging options. In basic mode, every transaction is logged.

In time interval mode, data is logged at the end of each T minutes, with T a user-defined number. In transaction count mode, on the other hand, data is logged each N transactions, regardless of time involved.

Since mode and frequency parameters can be dynamically changed, users can tune their monitoring, and their analysis.

The Jars package costs $4,000 (DOS/VS) or $6,000 (OS/VS) while the CICS/VS Interface option adds an additional $3,000 (DOS/VS) or $4,000 (OS/VS). Johnson is at 8400 Westpark Drive, McLean, Va. 22101.

NCR Enhances 'Scholars' System

DAYTON, Ohio – Data bases created under NCR's Scholars student record programs will be accessible through terminals attached to an 8200 minicomputer with an inquiry/data entry module just announced by NCR.

Scholars includes five separate but complementary applications which use common data entry routines and draw on a single data base. Originally designed for use on Century mainframes, they were made available to 8200 users under Century 101 simulation, but operations were still in batch mode.

The on-line module operates under NCR's Interactive Multiprogramming Operating System (Imos) and allows as many as seven CRT terminals to be attached to an 8200 to enter and access data, a spokesman noted.

The minimum configuration needed for the Scholars 8200 system is a 48K processor, a CRT terminal, two disk units, a line printer and a card reader.

The entire Scholars system, including the on-line module when it becomes available in the first quarter of 1977, will cost $850 plus a monthly license fee of $120. The combined fees for Century 101 simulation and Imos add another $25 to the monthly cost, NCR noted.

Because Paragraphs Cost Time

Structured Programmers Should Build on Sections

By Stephen E. Wright
Special to Computerworld

Concepts and Techniques

Many teachers of structured programming in Cobol as it exists today recommend the compulsory use of EXIT paragraphs and of the THRU option of the PERFORM verb.

This leads to extra work on the part of the programmer. More important, it reduces the readability of the program, both by the duplication of names in the PERFORM and by the proliferation of superfluous paragraph names.

Fortunately, an alternative exists in the use of sections, rather than paragraphs, as the basic building blocks (modules) of structured programs.

If this approach is adopted, several important improvements in readability result:

• The PERFORM verb is always used without the THRU option. The statement:

```
PERFORM   GET-NEXT-TRANSACTION
          THRU
          GET-NEXT-TRANSACTION-EXIT
```

is not only more awkward than:

```
PERFORM GET-NEXT-TRANSACTION
```

but even further away from the presumed intent of the programmer, which is an ad hoc COBOL "verb":

• Since paragraphs within a section are implicitly qualified by the section name, they need not be unique across sections. As a result, short, meaningless paragraph names can be used as the destinations of local GOs for such things as looping, exit to the end of the section or any other local transfers required by the current absence of true structured programming constructs in COBOL.

The use of short, meaningless names for local *points* in the text enhances the effect of meaningful names for *processes* represented by sections. For example:

```
GET-NEXT-TRANSACTION SECTION.
A.
  PERFORM READ-TRANSACTION
  IF NO-MORE-TRANSACTIONS
    GO TO X
  ELSE
    IF TRANSACTION-CODE NOT = 'T'
      PERFORM PRINT-ERROR
      GO TO A.
  PERFORM PRINT-TRANSACTION.
X. EXIT.
```

While there are limitations to this approach (for example, in declarative sections), it offers more readable structured programs for those users who have no access to more powerful techniques, such as the use of preprocessors.

Wright was one of the founders of and is now a senior staff consultant with Applied Data Research, Inc. in Princeton, N.J.

Diversifiedata Has Package for IBM 32 Users

COLUMBIA, S.C. – The Total Business Package (TBP) from Diversifiedata Services was designed to provide users of the IBM 32 with programs for payroll, inventory control, accounts receivable, accounts payable and general ledger accounting.

The payroll processing includes all the conventional features: check writing including year-to-date totals on check stubs; accumulation of data for and preparation of 941A reports and W2 forms; generation of time sheets for the next time period; and department cost reports.

Tax calculations – for salaried or hourly employees – are normally based on federal and state withholding tables with support for "numerous" deduction codes. The program permits extra compensation to be paid in a specified period without excessive tax amounts being withheld, the vendor said.

The inventory control program supports recording of basic information and retention of demand information for 13 months. That provides both comparison of the current month to the same month a year ago and a picture of how demand has changed over the year-long period, a spokesman explained.

The accounts receivable system can be set up for open item or balance forward accounting with statements and, if desired, invoices. Service charges can be applied selectively and the program produces an "aged" list of accounts.

Writes Checks, Reports Expenses

The accounts payable portion of the package writes checks for payment of invoices and notes which invoices are covered by each check. A distribution report shows current, last week and year-to-date expenses by account number.

The general ledger supports "any size" chart of accounts and includes percentage or budget dollar comparisons on the income statement. Reports for two or more locations may be combined, the company said.

The entire TBP, including source code, documentation and installation materials, costs $5,000, the spokesman added from Suite 406, 240 Stoneridge Road, Columbia, S.C. 29210.

Three User Groups Set Meetings

User groups in Connecticut, Indiana and New York are planning meetings in the next few weeks at which presentations of the ASM2 disk space management package from Cambridge Systems of Cupertino, Calif. will be featured.

The meetings are open to any interested users, group leaders said.

The Indiana OS/VS Users Group has scheduled its meeting for Thursday, Nov. 18, at a user site in the Indianapolis area. In charge of planning the session is Rolland Chastain, Public Service of Indiana, 100 E. Main St., Plainfield, Ind. 46168.

The Hartford, Conn.-based MVT Users Group (MUG) is planning to have its gathering on Tuesday, Nov. 30. The person to contact is Fred Goff at Connecticut General Life Insurance Co. in Hartford.

In New York City, the TSO Users Group has set Thursday, Dec. 2, as its meeting date. Further details of time and place are available from Tom Torregrossa, Irving Trust Co., 40 Rector St., New York, N.Y. 10005.

Cosmic Retrieve/Display System Designed for Univac 1100 Sites

ATHENS, Ga. – The Marshall Information Retrieval and Display System (Mirads-2) from the Cosmic clearinghouse is said to be a versatile command-driven data management system for Univac 1100 sites under Exec 8.

Used for such diverse applications as personnel management, manpower analysis, task management and space shuttle payload planning, the system supports storing and searching, sorting, both simple and complex computations, updating and printing or displaying output, Cosmic said.

Mirads-2 was designed for use by non-DP-oriented personnel; the commands offer the user flexibility in applying them to data management tasks, a spokesman added.

Familiarity with the commands can be gained in a period of a few hours, he claimed.

Data files under Mirads-2 may be structured to eight levels of subordination and each level may have as many as 10 different record types. Data security is provided at the data base file, record and field levels, the spokesman noted.

The computing capabilities include counting, summing and exponentiation as well as the four basic arithmetic operations. User-formatted output displays and reports are also part of the system, Cosmic said.

The free format user inquiry language supports multiple users of multiple files; response times of 3- to 5 sec for files of 5,000 records are possible through the use of an inverted list indexing scheme, the spokesman continued.

Written largely in Cobol and Fortran but with 15% Assembler code, Mirads-2 runs on a Univac 1108 under Exec 8 and requires 32K 36-bit words of main memory. It operates in batch mode or on-line.

Distributed on Univac Furpur-formatted tape, the system is available – as program number MFS-23510/CW – for $2,300. Documentation is available separately for $34.

Cosmic, which handles distribution of government-developed software to the general DP community, is at Suite 112, Barrow Hall, University of Georgia, Athens, Ga. 30602.

IESI Releases 'Quick' For Datacorder Users

SEATTLE – International Entry Systems, Inc. (IESI) has introduced Quick, a software package designed to help users of the company's Datacorder intelligent terminal [CW, Sept. 6] create data entry routines without programming.

With the package, the nontechnical user gains two programs: a format generator and a "combiner." The generator is used in an interactive mode, requiring input from the operator to create specification tables, an IESI spokesman explained.

The combiner then assembles a data entry program from the tables. In this last step, the operator need only type in a title and program number, he said.

The user programs can be used to create or confirm check digit calculations, validate entries on the basis of acceptable specific values or ranges or to act as a key verification routine for data just entered.

The technique supported by Quick is said to be easier for the non-DP user to manage than the "fill-in-the-blank" technique used by some other software.

Quick is available to Datacorder users for $100 to cover the cost of tape preparation and documentation, the spokesman added from 408 N.E. 72nd St., Seattle, Wash. 98115.

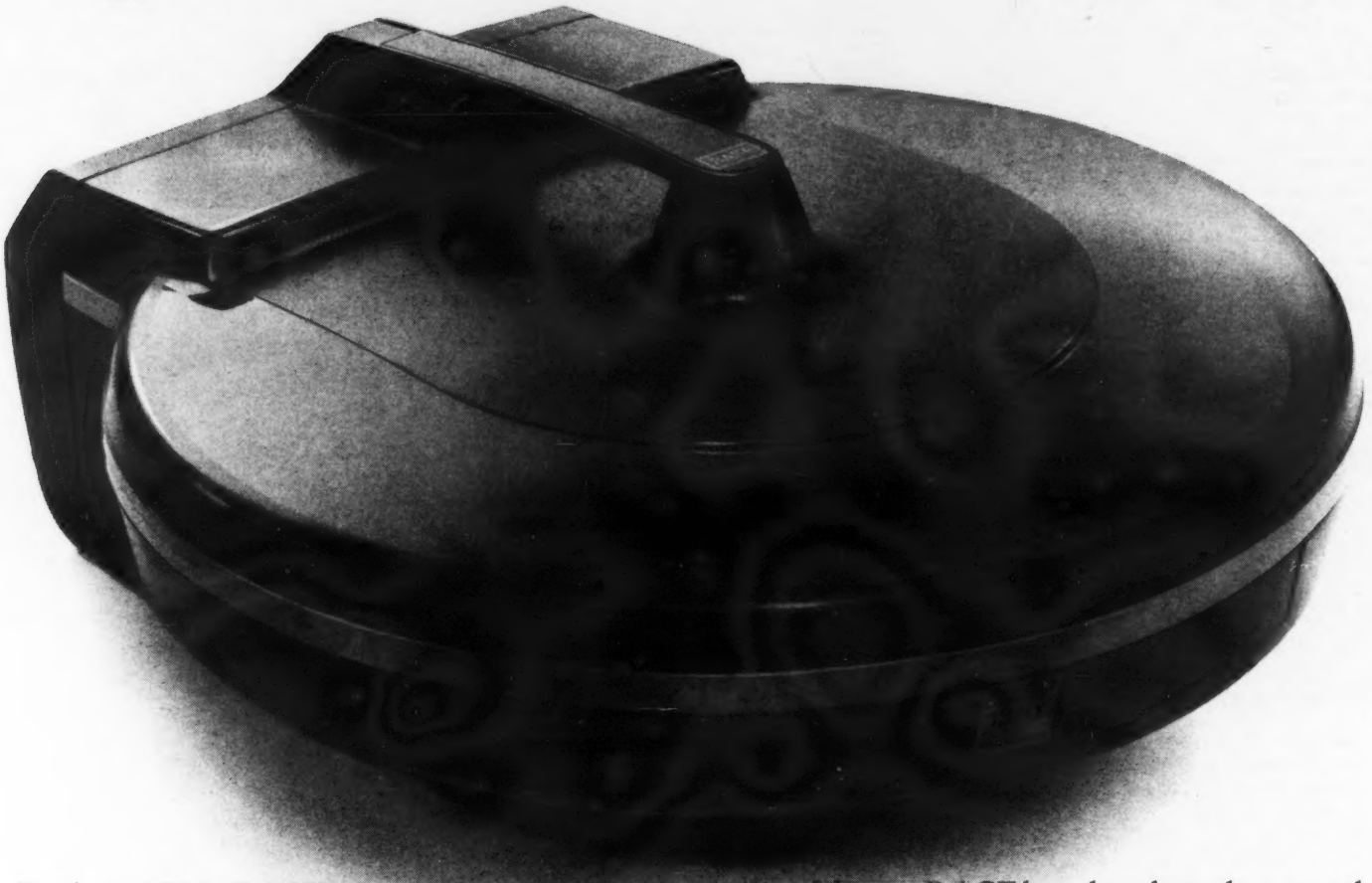
'Insyd' Gives 3277 Look At State of DOS/VS Systems

GREAT NECK, N.Y. – The Instantaneous System Display (Insyd) package from Labyrinth Systems, Inc. supports an IBM 3277 CRT to provide the DOS/VS systems programmer with "an immediate visual picture" of the state of the system, the vendor said.

The CRT display was designed to show the total system load and a breakdown of the resources currently in use, including the working set requirements of each program. The data is updated at a user-selected frequency; the maximum allowable interval is 9 sec, according to Labyrinth.

Insyd costs $3,000 and is available now from Labyrinth Systems, 17 Barstow Road, Great Neck, N.Y. 11022.

The inventors of magnetic tape make a more reliable "Winchester"...and it's guaranteed forever.



Back in 1932, BASF invented magnetic tape . . . the forerunner of such modern data processing media as the 3348 "Winchester" Data Module. And, because our error testing is twice as critical as drive manufacturer's specifications, we warranty our Data Module to be free from manufacturing defects for as long as you use it.

BASF research has made significant improvements on the Winchester. While still completely compatible with existing 3340 drives, our new Data Modules feature an exclusive oriented oxide coating and polishing technique which offers 30-35% better resolution properties than competitive Winchester-type packs.

Our new finish allows the read/write heads to fly uniformly and four times smoother than independent competitive module heads . . . resulting in greatly reduced possibilities of error generation. In addition, BASF has developed a special disk-surface lubricant, which eliminates disk coating wear and consequent contamination and errors. This lubricant also eliminates, for the first time, any possibility of a head sticking to the disk surface while the module is stored.

BASF Data Modules are available in three configurations: the 1335 Module, with 35 million-byte capacity; the 1370, with 70 million-byte capacity; and the 1375, with fixed head and quicker access.

For complete details on the BASF "Winchester" Data Module, write: BASF Systems, Crosby Drive, Bedford, MA 01730, or call our nearest regional office: in Los Angeles, (213) 451-8781; in Dallas, (214) 233-6607; in Chicago, (312) 343-6618; in Clifton, N.J., (201) 546-9111; in Montreal, (514) 341-5411; and in Toronto, (416) 677-1280.

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Tax Service Saves Furniture Designer $7,500

ZEELAND, Mich. – The $7,500 or 700 man-hours that would have been spent in after-the-fact determination of local taxes is what John Ruster, senior systems analyst of Herman Miller, Inc., has reported his company saved in fiscal 1975 through the use of a service.

Available on a subscription basis, Salestax from Vertex Systems, Inc. of King of Prussia, Pa., is a file of current tax rates for all sales tax jurisdictions in the U.S. recorded on magnetic tape to allow application of appropriate state and local taxes to the billing amount.

The service includes monthly updates of all rate changes, thereby eliminating sales tax rate maintenance for the subscriber, Ruster explained.

Marketing Statistics

Herman Miller, Inc. is a designer and manufacturer of contemporary furniture whose products are marketed in the U.S. and abroad. The company is registered to do business in 41 states.

In 1975, the first year Herman Miller subscribed to Salestax, the company serviced about 22,000 customer orders using an IBM 370/135 for processing everything from order acceptance to final shipping.

"It took about 180 hours over a period of six to eight weeks to complete the entire systems and programming work required to interface the Salestax file into the current Herman Miller billing system," Ruster said.

"We now use the service in our order entry, invoicing and order revision systems and are also taking advantage of the national geographic breakdown the service provides to develop important marketing statistics. These statistics, which give us buying power by county, have already resulted in a realignment of our territories and the establishment of new regions, he said.

"We expect in the near future to attempt various forecastings based on U.S. government statistics available on the furniture business, including buying power indexes and projections of population growth," he added.

"With the geographical code structure Salestax provides, we are able not only to retrieve current sales tax rates at state, county and local levels for application to the billing amount, but also to summarize automatically by geographical location. This summarization can then be automatically interfaced to our general ledger system to record our sales tax liability.

"The printouts we produce through this process become the source for our entries on state tax reporting forms," Ruster said.

Previous Exposure

Roy Keech, Herman Miller vice-president of finance, also expressed satisfaction with the service, which "gives us the capability of meeting our tax compliance obligations in a more efficient and expeditious manner.

"Previously, our inability to easily determine local tax rates made the recovery of local taxes burdensome, causing substantial exposure to Herman Miller," Keech recalled.

James Von Ins, assistant secretary and treasurer, voiced still another reaction. "Tax assessments," he said, "can be substantial. Failure to bill the full amount of sales tax in one state alone where we are registered can mean an assessment of tens of thousands of dollars in a single year. Salestax gives us the required information to completely eliminate this exposure."

Compiler Free To GRI 99 Users

NEWTON, Mass. – An RPG-II compiler which is said to permit terminal operators linked to the company's System 99 business computer to interact with running RPG programs is now available from GRI Computer Corp.

Used in conjunction with the GRI RPG-II source editor and interactive execution Control Language, this interactive terminal support means users can sit at a CRT terminal, enter RPG-II source statements, edit the code, compile, link, execute the program and interact with it in real-time without any punched card input, a spokesman explained.

As many as four terminals can be supported remotely by a single System 99; user activities are "fully multiprogrammed" so a range of functions can be performed concurrently, the company added.

The compiler is available free to System 99 users, GRI said from 320 Needham St., Newton, Mass. 02164.

Use of Cobol Coding Margins Avoids Need to Switch to PL/I

By M. Curtis Stordahl
Special to Computerworld

Concepts and Techniques

Top-down structured coding has been the normal technique for goal directed programming (GDP). PL/I is one of the few languages readily adaptable to top-down work, but many DP departments are not ready to jump to a new language – new for their installations – just to use this technique.

And they don't have to make such a switch because top-down programming is not the only method for achieving GDP.

In GDP, we need the ability to group statements to define individual goals and implied iteration of these goals.

In PL/I, we can group statements into DO groups by placing the statements between a DO and an END. In PL/I, we can group statements into DO groups by placing the statements between a DO and an END. In Cobol, we can group statements into paragraphs by placing them in the B margin, following a paragraph name in the A margin.

Implied iteration in PL/I is accomplished by an IF condition THEN DO and a DO WHILE (condition). In Cobol, we can use the IF condition PERFORM paragraph-name and the PERFORM paragraph-name UNTIL condition.

Suppose we were given a top-down algorithm and were asked to code it into Cobol. First, we would identify the groups by nesting level and place them into paragraphs. Then we would substitute the DOs with PERFORMs.

Thus, if we were given the following top-down algorithm:

```
NEST
1 IF A THEN DO;
2   STATEMENT 1;
2   IF B THEN DO;
3     STATEMENT 2;
3     DO WHILE C;
4       STATEMENT 3;
4     END;
3     STATEMENT 4;
3   END;
2   STATEMENT 5;
2 END;
1 STOP;
```

This can now be transformed into the following Cobol-like code:

```
NEST-1.
  IF A THEN PERFORM NEST-2.
  STOP RUN
NEST-2
  STATEMENT 1.
  IF B THEN PERFORM NEST-3.
  STATEMENT 5.
NEST-3.
  STATEMENT 2.
  PERFORM NEST-4 UNTIL C.
  STATEMENT 4.
NEST-4.
  STATEMENT 3.
```

'Eurocomp' Papers Now in Two Volumes

LONDON – Published in two volumes, the proceedings of the European Computing Congress (Eurocomp) held here earlier this autumn [CW, Sept. 20, 27] are now available from the meeting sponsors, Online Conferences Ltd.

Reflecting the makeup of Eurocomp itself, one of the books has all the papers presented on computer performance evaluation. The other volume covers the software engineering presentations.

Because of the differences in subject matter and the possibility that individual readers might be interested in one but not both, the books are separately priced.

The firm is on Cleveland Road, Uxbridge, Middlesex UB8 2DD, England.

Mumps Guide Available

ST. LOUIS – A 12-page pocket guide to the Mumps language [CW, Sept. 13] has been prepared by and is available free from the Mumps Users' Group (MUG), according to Joan Zimmerman.

Single copies of the guide can be requested from Zimmerman, MUG, 700 South Euclid Ave., St. Louis, Mo. 63110.

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On-Line DBMS Backs Health Care Delivery Research

SAN JOSE, Calif. – A research group at the Kaiser/Permanente Clinic here is investigating a systematic approach to improving health care delivery in a prepaid setting. Early in this effort, the project leader began to look for a data base management system (DBMS) that could help him.

The principal thrust of the project is to identify the health status profile of the member population, to recognize health risk factors in individual members and to perform the necessary health testing, health education and health maintenance functions to keep the overall population at the highest possible level of health.

To accomplish this, an extensive data base was developed on a sample volunteer population of 5,000 patients. Over 1,000 data elements are stored per patient, consisting of medical chart information, past medical history, psychosocial, demographic and statistical data.

Dr. Robert Harrington, principal investigator of this Department of Health, Education and Welfare-funded project, and physician-in-chief of the San Jose medical facilities, asked

Data Basics

Con Koreneff, his project director, to organize the data so quick retrieval would be possible to support the needs of the multidisciplined research staff. This research staff consists of doctors, nurse practitioners, psychologists, health educators, biostatisticians and outside consultants, including several Ph.D. candidates who are writing their theses around the project results.

The questions asked of the data base by this mixed group of researchers may involve correlations between any two or more elements of data. Since the objective is to develop an algorithm for "treatment seeking behavior" and "risk factors," the researchers are not discounting any information as a possible predictor of criterion variable.

An on-line terminal environment is superior to batch in such an effort because it allows researchers to ask a series of questions in an interactive fashion. They are free to pursue whatever ideas occur to them on the basis of previous interactions, without having to wait out the turnaround imposed by batch processing and then trying to recall exactly why they took the last step or what they wanted to do next.

Ultimately, the Nomad DBMS on the National CSS network was selected as the best vehicle for the project. With its relational capabilities, it permits the flexibility of accessing large amounts of data from a single structure without extracting subsets of data to fit limited structures, Koreneff said.

This project has been on-going for three years and has been renewed for three more. Harrington and Koreneff feel the data management concepts developed in this project are a prototype for future health care delivery systems.

DBA Meeting Set

PHILADELPHIA – The Wharton Seminar on Data Base Administration (DBA) will be held at the University of Pennsylvania early next month, according to a Wharton spokesman.

The meeting, on Dec. 9-10, will consider the technical, organizational and economic issues facing the practicing data base administrator. One of the features will be the presentation of results of a DBA survey, he added.

The fee for the seminar is $125, he said.

More information is available from Prof. Richard Hackathorn, Dept. of Decision Sciences, Wharton School/CC, University of Pennsylvania, Philadelphia, Pa. 19174.

Supports DOT and Education Centers

California Network Marks 'Firsts' for Bell, PT&T

By Ronald A. Frank
Of the CW Staff

SAN FRANCISCO – Pacific Telephone & Telegraph Co. (PT&T) has been operating a packet-switched digital data network for the State of California since early this year.

The transparent user network supports a variety of terminals including asynchronous and synchronous devices operated by the California Department of Transportation (DOT) and the state's system of 19 colleges and universities.

Called the Automatic Telecommunications Switching System-Data Services (ATSS–DS), the network marks several firsts for PT&T and the Bell System, according to a PT&T spokesman.

The network utilizes non-Bell switching equipment provided by Computer Transmission Corp. (Tran), which is installed and supported by PT&T.

It is the initial packet-switched service operating within the Bell System, although the Transaction Network Service (TNS), available from some Bell companies, has certain packet-type characteristics, but it does not support the broad range of terminals handled by ATSS-DS, the spokesman stated.

300 Terminals

The private line network includes 27 Tran multiplexers installed at state agency offices that are connected to the network. About 300 terminals are operating on the network including equipment from Hazeltine, Univac, Teletype Corp. and others, he indicated.

Most of the traffic is generated from asynchronous terminals to CPUs, although the net is also transparent to synchronous devices. Any two terminals on the network can transmit data to each other although most of the net is used to access CPU information from terminals operating in an interactive mode.

Terminals with traffic establish a virtual connection to transmit data on the network. When a terminal makes a "bid for service," it identifies itself with an auto-baud character that includes the speed of data and the code that will be used.

After receiving an acknowledgement character from the network, the terminal operator keys in the address of the called location and data is ready to be transmitted.

Connection to the network takes less than one second, the spokesman said.

The network supports devices operating in Ascii, Ebcdic, and correspondence code. Binary Synchronous terminals are also accommodated, but only the asynchronous data is packetized on a character basis, he noted.

Three Line Levels

Three levels of lines exist. The terminal connects to a multiplexer which in turn handles multiple-terminal traffic and directs it to the nearest switch point. Traffic between switches is considered the long-haul segment of the network and this interswitch traffic is packetized.

Start and stop bits are stripped of messages and packets are assembled ranging from a few characters to about 100 characters in length. A packet is transmitted once every 100 msec forming a time slot on the net.

At present, two main switch points in Los Angeles and Sacramento, Calif. are in operation. The Sacramento switch, where the Department of Transportation DP center is located, also acts as the network control center for the system.

Most of the interswitch lines in the network operate at 4,800 bit/sec with Bell 208 data sets. There is some higher speed traffic from remote batch terminals at 9,600 bit/sec and these use Bell 209 data sets.

Terminals now on the network operate at speeds from 10 char./sec to 4,800 bit/sec and the interswitch lines may be upgraded from 9,600 bit/sec to 50k bit/sec soon, the spokesman said.

By spring 1977, the full network is scheduled to be operational and four main switch points will be interconnected with alternate routing capabilities for most parts of the system, he stated.

The full network will service five state agencies spanning 500 miles across most of California.

Current Tariff

The ATSS-DS network is operated under a tariff that includes the usual equipment charges in addition to private line intrastate rates. The current tariff is applicable to the ATSS-DS service, but the spokesman said the firm is evaluating the possibility of providing a similar service to other data users.

The present tariff makes no provision for the volume of traffic being handled on the network. Instead, a magnetic tape of traffic per site is generated at the Sacramento net control center and this data is used by state officials to allocate network charges among the various using sites.

It is expected that a similar service for business users would include another rate component based on the volume of traffic being transmitted on the network, the spokesman said.

The network makes use of portions of the Bell Dataphone Digital Service (DDS) network for interswitch links, but at present it is not an all-digital service.

Representatives of AT&T and other Bell System operating companies have visited the ATSS-DS facilities and similar services are being evaluated although no definite decisions have yet been made, the spokesman reported.

Correction

National Semiconductor Corp.'s Corporate Data Center is presently using the MVT Wylbur software originally developed by Stanford University, not Optimum Systems, Inc. (OSI) Wylbur, [CW, Oct. 25].

In the near future, the center will change over to software called MVS Mentext from Mentel, Inc. of Palo Alto, Calif., which has a command structure which looks like Stanford's Wylbur.

Datapoint Extends DP Functions to Phone Area

SAN ANTONIO, Texas – Datapoint Corp. has expanded and extended the functions of the terminal-based DP system into the telephone facility usage area with the introduction of Infoswitch.

Datapoint's computer-based Infoswitch is basically a Datapoint 1100 terminal system with console, CRT, typewriterlike keyboard and disk or diskette drives coupled with telephone switching equipment developed by the company, a spokeswoman said.

It is designed to interface and supplement a user's existing Centrex on PBX telephone system and controls and account's for long-distance telephone facility usage on Wats. foreign exchange (FX), tie lines or other voice communications facilities to achieve the optimum line utilization, the company claimed.

In addition to the system's dynamic routing functions, it records information on each call on either cassette- or cartridge-tape, it said.

Dual-Processor Arrangement

A dual-processor arrangement utilizes a microprocessor switching matrix with a built-in 16K program and 4K of data space, the spokeswoman noted, adding the intelligent switch is factory programmed.

It also comes with an intelligent real-time controller – a standard Datapoint CPU with 48K of internal user memory – for functions such as call logging, system monitoring and management report generation, according to Datapoint.

The system includes a standard typewriter-like keyboard, 11-key numeric keyboard, five control keys and an 80-column by 12-row CRT. It can also support a printer for hard-copy output of system utilization data, the spokeswoman said.

Communications Controller

The communications controller is microprogrammed to act as a dedicated manager for all details of call placement including a caller identity number, the phone number dialed, time of day, date and the type and duration of the call.

The controller can also offer uninterrupted long-distance service in the event of CPU or other system failure, according to the firm.

The storage media include diskette drives capable of 250K-byte storage each and cartridge disk systems that each store 5M bytes of data, according to the spokeswoman.

Two diskette drives or one cartridge drive system come with basic Infoswitch systems which can be upgraded to four diskette drives or two cartridge-drive systems for maximum storage of 1M and 10M bytes, respectively, she added.

In operation, the caller enters an identity number and dials the long-distance number. The identity number is checked by the system for the associated employee-usage privileges.

When all of the applicable fixed cost lines are busy, Infoswitch can hold the call until a facility is free or, if the caller identity number permits, use the direct-distance dial (DDD) lines after a warning tone has signaled the more expensive line utilization, the company claimed.

Features in addition to transaction identification information include speed numbers for regularly dialed numbers, multistage call holding and remote access functions, Datapoint said.

The basic six-trunk Infoswitch/6 comes with two diskettes with controller, keyboard and display, switching controller and matrix, CPU, tone receiver, termination cabling and the Infoswitch software package for $35,000, the company said.

The same Infoswitch/6 with cartridge disk instead of diskettes costs $46,900 and leases of one to five years are available, according to the spokeswoman.

There is a monthly maintenance and a one-time installation charge for each type of system, she added.

A line of peripherals for Infoswitch is available from the company including a printer, tape transports, remote data collection interface, remote communications link, tone digit receivers and backup power supplies, Datapoint said.

Deliveries of Infoswitch will begin in the first quarter of 1977, the firm said from 9725 Datapoint Drive, San Antonio, Texas 78284.

Hospitals' Terminals Aid Heart Patients Recovery

By John P. Hebert
Of the CW Staff

NEW YORK – Computer terminals in the intensive care units (ICU) of the Mt. Sinai Hospital here and another facility in Texas are reportedly helping to reduce the incidence of unexpected, life-threatening events for heart surgery patients.

The terminals and heart and lung monitoring equipment have reduced sudden critical complications from 12% to .2% for patients recovering from cardiac surgery and have forced doctors and nurses to be acutely aware of their patients' conditions, according to a Mt. Sinai spokesman.

'Somewhat Crude' Terminals

Eight to 10 terminals are located in the Mt. Sinai ICU while two similar terminals monitor heart surgery patients at Wilford Hall Air Force Hospital at Lackland Air Force Base in San Antonio, Texas.

The "somewhat crude" CRT terminals, according to Hillard Fitzkee, their codeveloper and a biomedical engineer at Mt. Sinai, are alphanumeric devices with graphic capabilities and computer-controlled matrices.

Terminal Transactions

They are quite unlike typical business-type computer terminals because they have a finer resolution, required for the patient trend analyses, than do ordinary graphics terminals, Fitzkee said.

The 18-bit units, modified by Fitzkee and coworker Richard DeAsla, are based on Princeton Electronics Products (PEP) CRT graphics terminals. The units operate with Tektronix, Inc. storage tubes equipped with Ascii keyboards made by Microswitch Corp., Fitzkee said.

Six additional terminals are located in doctors' offices to facilitate access to a particular patient's file, he noted.

These terminals, along with the two in Texas, are linked to a 48K, 16-bit-word IBM 1800 data acquisition unit in New York with four partitions, 22K of variable core and four IBM 1810 disk drives capable of holding 2M words of patient information, he said.

The system is used for a variety of reasons, he explained. It helps to integrate information from monitoring equipment at the bedside. It also relieves doctors and nurses of calculating intravenous drug dilution ratios and compiling clerical data on the patients, in addition to making all compiled data easily retrieved, Fitzkee said.

Another – actually the most important – function is automatically analyzing the condition of an open-heart surgery patient "on a breath-by-breath basis," rather than having to wait 30 minutes or more for laboratory analysis, he said.

In this way, he explained, the doctor can immediately determine if the patient's blood has too much or too little vital gas content in the critical 24- to 48 hours following the operation.

Being able to tell how fast the patient's condition is changing is most helpful, he continued. It has made doctors more aware of problems with postsurgery patients, eliminating the "ignorance is bliss" attitude unwittingly held by physicians supported by conventional equipment, he remarked.

High Reliability

The IBM 1800 process control machine was chosen for the medical application because of its high reliability, Fitzkee said, noting it is located in a room with primary and backup air conditioning equipment and un uninterruptible power supply.

The computer is running every hour of every day to service the terminals here and in Texas, he said.

Four analog signals send information to the CPU from a location between the patient and a mechanical respirator, monitoring 16 derived variables such as breath rate, oxygen consumption and carbon dioxide content, Fitzkee said.

The CPU "looks" at the patient's wave forms every 10 minutes for a trend analysis and assessment, although there is a special command for specifying two-minute-interval analyses to stabilize the patient, he said.

The analyses are displayed on the CRTs in the form of graphics and alphanumeric information for the physicians' use, he said.

Communications Link

At the Wilford Hall Hospital, information is sent through a communications link Fitzkee and DeAsla built from commercially available hardware because the standard communications adapter from IBM would have been too expensive for the additional core required for its operation, he explained.

The communications link is run on a synchronous start/stop basis at 2,000 bit/sec over dedicated voice-grade lines, he said, adding the error rate is low and the link is quite reliable.

The data from Texas passes through five channels on one half of the full-duplex line, with four channels for raw analog signals and the other channel digitally encoded for the key code commands, he said. Processed data returning from Mt. Sinai is all digital in format, he noted.

Part of Evaluation Study

The ongoing project at the Air Force hospital is part of an evaluation study to determine a standardized monitoring system for all hospitals in the U.S. with 400 beds or more, he said.

IBM will be involved in developing the bedside units, Fitzkee said. He also noted the system was developed 10 or 11 years ago by Dr. John Osborne of the Pacific Medical Center in San Francisco in cooperation with IBM.

Mt. Sinai was connected by phone lines to the West Coast center for two years before setting up its own system about two years ago, he indicated.

One of the reasons why more of these units are not in operation is that there is a large overhead cost for the computer and terminal monitoring equipment. It costs $30,000 to $35,000 for each bed, Fitzkee said, adding Mt. Sinai currently monitors 12 beds, although the system is capable of monitoring a total of 26.

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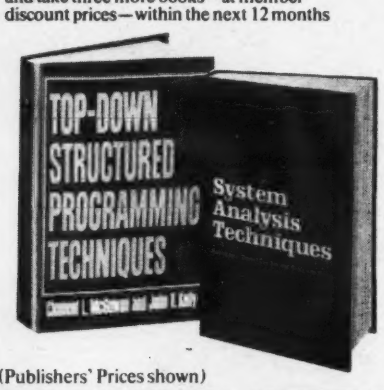

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Kit Allows Testing

PROVIDENCE, R.I. – International Data Sciences, Inc. (IDS) has introduced its Model 25 full-duplex long word converter, designed for installation in any Western Electric Co. 914B or Sierra Electronic Corp. 1914B data test set.

The Model 25 reportedly extends the capability of the test set to allow the full-duplex testing necessary to perform loopback tests and two-way, end-to-end tests of data transmission links.

It is a kit consisting of two printed circuit boards and hardware; a control panel; harnessing; and a switch-marking overlay, IDS said.

Installation of the kit device adds a 2,047-bit test pattern transmitter and receiver, the firm said.

The converter is priced at $750 from IDS at 100 Nashua St., Providence, R.I. 02904.

Detachable Keyboards Also Debut

Adds Introduces Burroughs-Compatible Terminals

HAUPPAUGE, N.Y. – Applied Digital Data Systems, Inc. (Adds) has expanded its line of CRT terminals with a unit designed to work with Burroughs mainframes and detachable keyboards for its standard Consul terminal products.

The Consul 980B is being offered as an alternative to or replacement for Burroughs TD 700 and TD 800 series of terminals, according to an Adds spokeswoman.

The unit offers additional standard features compared with the Burroughs terminals such as graphics capabilities; a security keylock; program attention and program function keys; a separate function keypad; and a separate numeric keypad, the spokeswoman noted.

The numeric keypad can be converted at no charge to a user-programmable function keypad, she said, adding it can still be used as a numeric keypad after conversion.

The Consul 980B also includes a full 96-character Ascii keyboard, parallel and serial peripheral interfaces; and communications speed capabilities up to 9,600 bit/sec.

Adds thermal and impact printers can be attached directly to the 980B to allow local printing; the printer offered by Burroughs for its terminals must be attached to the terminal controller, which prohibits local printing, Adds said.

The Consul 980B can operate either synchronously or asynchronously with all mainframes in the Burroughs B1700 through B7700 lines, according to Adds.

The 980B's CRT displays 1,920 upper and lower case Ascii characters in a 5 by 7 dot matrix format and includes simultaneous graphics and alphanumeric information display capabilities, the spokeswoman said.

There are 11,520 addressable graphic elements on the CRT and the graphics refresh rate is 60 frame/sec on domestic 980B models, she added.

The 980B costs $3,200 or $90/mo on a three-year lease.

Detachable Keyboards

Adds' D-Series terminal models have adjustable keyboards which can be placed up to two feet away from the terminals' display screens.

D-Series units – the Consul 520D, 580D, 920D and 980D – are identical to the standard teletypewriter-compatible models in the Adds line except for the keyboard connection, the firm noted. They are said to be about one inch longer than the standard Consul units.

D-Series terminals will be available by the end of this year and cost $25 more than the prices for the standard Consul units, Adds said from 100 Marcus Blvd., Hauppauge, N.Y. 11787.

WS Micro-Based Terminal Designed for Industry

EDINA, Minn. – The Computer Division of The Warner & Swasey Co. (WS) has introduced the RT-4, a microcomputer-based intelligent terminal system intended for heavy industrial applications.

The RT-4 consists of a family of 4-bit microcomputer modules built around the Intel 4040. It can be used in energy management, remote process monitoring and control, security systems and machine safety monitoring systems, the company said.

The terminal system is comprised of a series of modules mounted on a motherboard, which includes a watchdog timer.

Available modules include a CPU; a memory module with 1K- by 8 bits of programmable read-only memory and 320- by 4 bits of random-access memory, WS said.

The system is contained in a wall-mounted oil- and dust-tight enclosure

A basic RT-4 system with CPU, memory, eight photo-isolated inputs, eight outputs, 20- or 60 mA current loop interface, power supply and enclosure is priced at $1,495, with a delivery schedule of 60 days, the spokesman said from 7413 Washington Ave. S., Edina, Minn. 55435.

Ask CONTROL DATA to supply Monolithic Memory for your IBM 370... get reliability you can bank on at half the price.

We have it.

How reliable is Control Data Monolithic Memory? Reliable enough for 15 U.S. banks to use it for critical financial processing with their IBM 370-158's!

And so reliable, more than 320 other U.S. firms bank on it for their 370-135's through 168's.

We've installed more than 450 Monolithic Memories already to help IBM-370 users cut processing costs. And our users are our best proof that CDC Monolithic Memories work.

If you'd like to talk to some of these users, just ask our Peripherals Representative. He'll supply references! He'll also point out other key reasons for choosing our Monolithic Memory:

Stability. We're not a one-product company. We've been around a long time, and we'll be around for a long time to come.

Single-source responsibility. We can provide plug-compatible, cost-effective CDC disk memory, tape drives, and other peripherals. You place total responsibility in a single vendor.

If you want 370 memory capacity at half the price or double the capacity at the same price ...if you want to save $40K to more than $500K ...ask us about CDC Monolithic Memory.

And ask us about the users who have proved it works. Call your local Control Data Marketing Office or mail the coupon today.

Mr. James Kuntuzos, Sales Manager, Peripheral Product Sales, Control Data Corporation, P.O. Box 1980, Twin Cities Airport, St. Paul, MN 55111. Dept. CW-11156.
Please have a Control Data Marketing Representative supply further information about your Monolithic Memory.

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We've Changed Our Name

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Alanthus Corporation has completed the aquisition of Leasco Data Communications Corporation, formerly a subsidiary of the Reliance Group. Leasco has been renamed Alanthus Data Communications Corporation and will be operated as a wholly-owned subsidiary.

Alanthus Data Communications Corporation is one of the nation's largest independent suppliers of a broad range of data communications terminals and related equipment.

Alanthus Data Communications Corporation
20030 Century Boulevard
Germantown, Maryland 20767
Telephone: 800 638-4006

Regional Sales Offices: New York, Washington, D.C. Chicago, Detroit, Los Angeles, Dallas, San Francisco, Pittsburgh.

Based on Intelligent Terminals

Teleprocessing System Saves Trucker $26,000/Year

CLEVELAND, Ohio – A truck manufacturer here is not only saving time moving parts from inventory, it is also experiencing an annual cost reduction of $26,000 with a parts receiving and distribution system based on intelligent terminals.

Parts arriving at White Truck's central parts warehouse here include everything from nuts and bolts to truck engines and cabs. They are checked at the loading dock and then moved to a receiving area, according to a spokesman.

Under White's former receiving and distribution system, the parts sat on the dock for two or three days waiting for receiving clerks to search tub files for master records to process on an IBM 1031 data collection unit, according to Tom Boggs, senior systems analyst.

Parrot System

With the Parts Automated Receiving and Redistribution On-line Teleprocessing system (Parrot) receipts are ready to move to the final destination on the same day they are received, Boggs, the system's designer, said.

Parrot operates with two IBM 3270-compatible Sycor, Inc. Model 250 intelligent CRT terminal systems and two printers, one with 80-char./sec and the other 165 char./sec capabilities, he said.

The terminals communicate with an off-site IBM 370/158 operating under Taskmaster control. Communications are bisynchronous at 2,400 bit/sec over leased lines, Bogg said.

When the checker moves parts from the loading dock to the receiving area, the purchase order is left at the office. The receiving office clerk enters the purchase order number and the quantity of parts received on the terminal.

Parrot then checks the files on the 370/158 at White Motors headquarters here and confirms the parts were ordered and are due for delivery.

'Normal Conversational Mode'

"All of the communications between the operator and the 250 are in a normal conversational mode," Boggs explained. "There are no difficult codes for the operators to learn."

The terminal and Parrot then interrogate the receipt and notify the CRT operator of early shipments, overshipments and backorders. For emergency situations, the operator is allowed to override a predetermined action of the terminal, he noted.

Once the system has determined the order is valid, several operations occur. The storage area is determined and backorder information is checked. A move ticket is printed in the receiving office. And a save area information file is written at the mainframe, he explained.

The move ticket is given to the warehousemen as authorization to move the parts to the stocking location. When the parts are in the bin, a portion of the move ticket is returned to the receiving office and then sent to the central computer site.

There the serial number is keypunched and entered into the CPU. Using the matched serial numbers, the mainframe updates the inventory file from the save area file, he said.

If the part received is on backorder, the terminal informs the operator how many parts are on backorder. The quantity needed to fill backorders is sent directly to the shipping area and the balance is sent to the storage area.

"This little feature of the system saves us several days in getting backordered parts on the way to customers," Boggs said.

Parrot can also inquire into the main inventory file and display available quantity information, last receipt date, bin location and other inventory data for a specific part, he added.

Another feature of the system allows the operator to add some information to the file on a purchase order.

"In some cases, a part number has been changed by the vendor," Boggs said. "With the add program, the operator doesn't void the entire purchase order, she simply changes the part number to conform with the files."

The system also allows the operator to delete a save area record through the use of the part serial number and to print any ticket that is lost in the warehouse, he noted.

A final feature allows the operator to list all the programs available with Parrot on the CRT screen and select the program needed for the operation about to be performed.

"There are two displays and two printers and we can run any two of the Parrot operations concurrently," Boggs said. "We can print move tickets on the fast printer and have an inventory status printing on the slower printer at the same time."

Terminal Transactions

IDS Device Switches Modem To CPU Channels, Terminals

PROVIDENCE, R.I. – International Data Sciences, Inc. has announced the desktop configuration Model 8506-D selector switch used to switch the 25-pin RS-232 or CCITT V.24 interface to either of two outputs.

Utilizing the switching device, one modem may be switched to either of two front-end processor data channels or to either of two computer terminals, the firm said.

The module can also switch a data channel from its on-line modem to a backup modem or switch it from a leased line modem to a dial backup, it added.

The 8506-D costs $110 from IDS at 100 Nashua St., Providence, R.I. 02904.

Introducing the data system for people who know how hard it is to get a data system up and running.

Anyone who's ever put in a data system will tell you how hard it is to get it up and running. And how expensive.

But it doesn't have to be that way anymore. Because Data General has developed a new interactive data entry and access system that's a lot easier to work with. Which makes your programmers more productive.

The ECLIPSE Idea system.

The Idea system has screen formatting and a data access/retrieval capability that's hard to believe. Because it's incredibly easy and economical to get it up and running.

What makes it possible is the Idea software. It's so powerful and easy to use, you can probably do interactive screen formatting and Idea compiling the day the system is installed.

And you won't have to worry about multiterminal control. Because the software to handle up to 16 terminals is already written. For single applications. Or for as many applications as there are terminals.

The Idea software is designed to work with INFOS (our data management software). It's so powerful that all your users can get at the same data at the same time. And so easy to use that they can access data records even if they know only half a reference.

And you won't have to worry about a lot of duplicate data. Because INFOS is designed to provide a single source of information that's always up to the minute.

Also, Idea software runs on our new ECLIPSE C/330 and C/300 commercial computers. They have just what's needed to keep all your users' information up to the minute. Because they run the Real-time Disc Operating System that controls multiterminal applications concurrently with batch or telecommunications jobs. And the commercial ECLIPSE computers include ADD, MOVE, COMPARE and decimal arithmetic instructions designed specifically for commercial applications.

With the ECLIPSE C/330 and C/300, you won't have to worry about compatibility either. Because they come with large systems languages like IBM-compatible RPG II and ANSI '74 COBOL implemented at the highest levels. Plus industry compatible nine-track magnetic tape units and communications controllers that let you pass data between computers.

And because Idea systems come from Data General, they come with the full support, range of field and systems services, and financial alternatives only a major computer manufacturer can offer.

Write for our brochure on the ECLIPSE Idea systems.

It won't tell you anything you don't already know about how data systems work. But it will tell you about one that'll take less work.

ECLIPSE Idea systems

Data General

Data General, Route 9, Southboro, Mass. 01772, (617) 485-9100. Data General (Canada) Ltd., Ontario.
Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361

Even in Real-Time Applications

Disk Devices Can Operate With Over 90% Efficiency

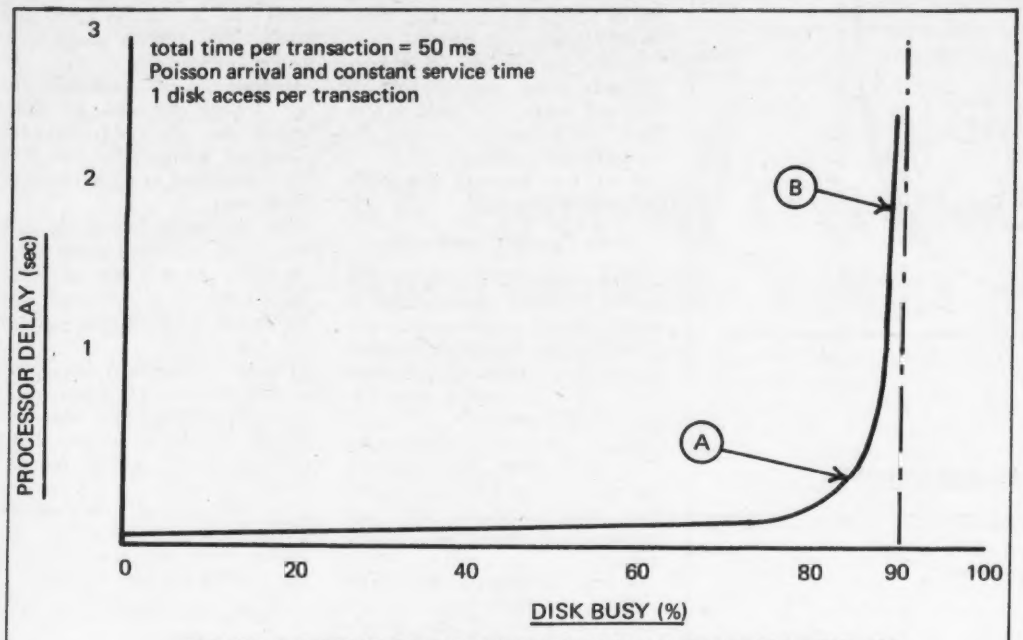


FIGURE 1. EFFECT OF DISK UTILIZATION ON PROCESSOR DELAY

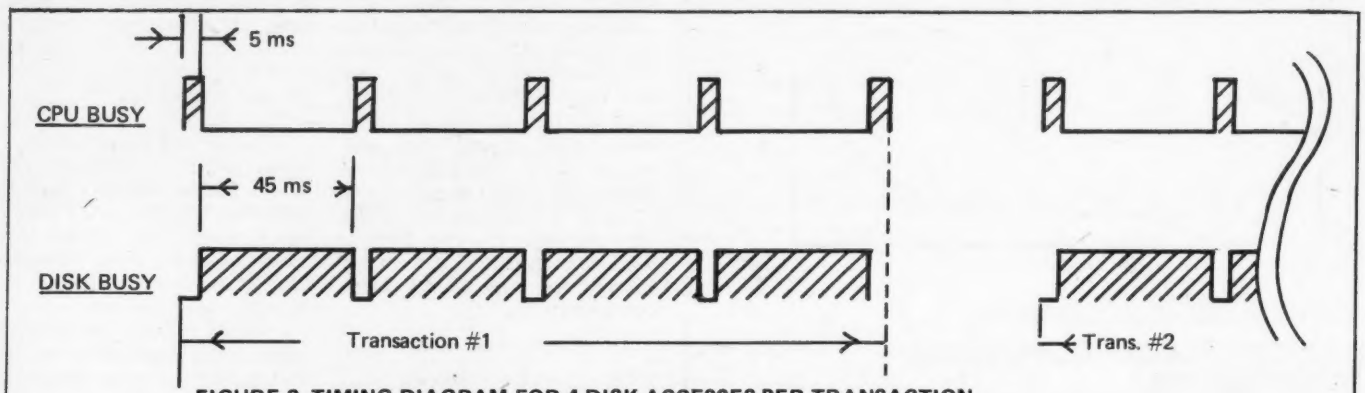


FIGURE 2. TIMING DIAGRAM FOR 4 DISK ACCESSES PER TRANSACTION

By Saul Stimler
Special to Computerworld

Disk devices can frequently be utilized at more than 90% efficiency without adversely affecting performance – even in critical real-time applications.

There are two broad capability considerations in the use of disk devices. One is storing the maximum amount of data per disk. The second is utilizing the maximum number of data transfers per second.

This article addresses the establishment of the maximum number of data transfers per second for a specific system.

This maximum is termed the operational capability and is defined as the maximum number of data transfers per second which will still permit meeting the timeliness requirements of the user outputs.

To introduce the method, consider a simple, 50-terminal real-time system which is used to obtain the status of customer accounts. Assume the application program and software are resident in main memory; the customer file completely fills one disk device; each transaction requires the reading of one 4,000-byte record from the disk; 5 msec of CPU time and 45 msec of disk time are expended serially per transaction processed.

In this system, therefore, each transaction requires a total elapsed time of 50 msec within the computer subsystem. The maximum possible disk utilization is 45 msec out of every 50 msec, or 90% busy. This would occur when one transaction is processed every 50 msec (which equals 20 transactions per second as well as 20 data transfers per second).

Timeliness Requirement

To establish the operational capability of the disk device, a timeliness requirement is necessary. Suppose that to meet terminal operator turnaround time requirements, the average busy hour delay within the processor subsystem is not to exceed two seconds.

Many measurements on operational systems have confirmed the results of simple queuing theory illustrated in Figure 1 describe simple real-time systems receiving inputs from more than 15 independent terminals.

The dot and dash line in Figure 1 marks the 90% maximum possible utilization of the disk. As the input rate increases to cause the disk to be more than 85% busy, the delay in the subsystem increases very rapidly.

(Continued on Page 42)

Cray-1 Gets Option

MINNEAPOLIS – Cray Research, Inc. has announced an optional error-correction capability for the Cray-1.

The option provides for correction of single-bit errors as information is read from or written into the computer memory, the firm said. Double-bit errors also can be detected and flagged.

The option adds eight check bits to each 64-bit word in the memory which facilitate the detection and correction, a spokesman added.

The CRAY-1 computer system is offered with memory sizes of a quarter-million, half-million and one-million words. Error correction options are priced at $295,000, $395,000 and $495,000 respectively; respective lease charges are $6,500, $10,500 and $15,500 per month, he said.

Cray Research is at 7850 Metro Parkway, Suite 213, Minneapolis, Minn. 55420.

Tab Unveils Key-to-Diskette Systems

PALO ALTO, Calif. – The Tab Products Co. 700 series of key-to-diskette data entry systems are designed for centralized, decentralized, and remote teleprocessing environments, the firm said.

Two versions of the 700 are available. The first is a single-station 701 which can be upgraded to the second, a dual-station 702, at the user's site with the addition of a second diskette drive, keyboard and tabletop, Tab said.

The series prepares and processes data on IBM format diskettes. When equipped with optional I/O interfaces, it transfers data records to and from a central CPU, the company noted.

The systems can be used in stand-alone or terminal mode with RS-232C, bisynchronous or standard teletypewriter interfaces, it added.

A single-station single-drive 701 includes 20 program levels, automatic program sequencing, multilevel program sequencing, a record length of one to 128 characters, search on record address, sequential content, content and end of data and operator prompting and verification.

The 702 features 10 program levels per station, the firm added.

Optional features for both units include a second diskette drive with disk copy for the 701, disk initialization, accumulate field totals and additional program levels.

The basic 701 costs $4,950 and the 702 costs $6,160, the firm said from 348 Waverley St., Palo Alto, Calif. 94301.

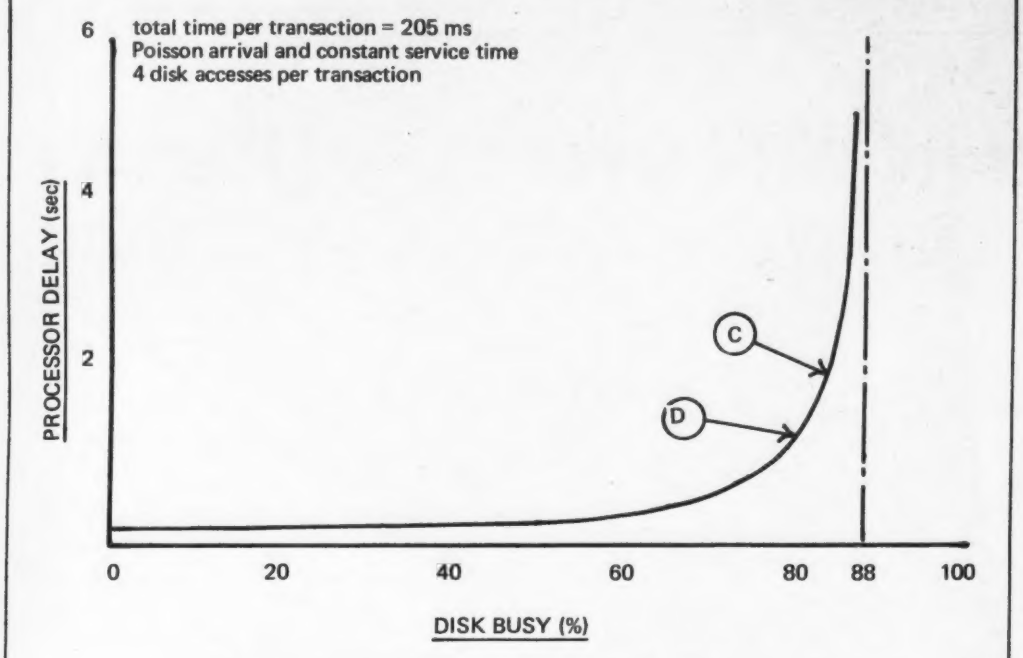


FIGURE 3. EFFECT OF DISK UTILIZATION ON PROCESSOR DELAY

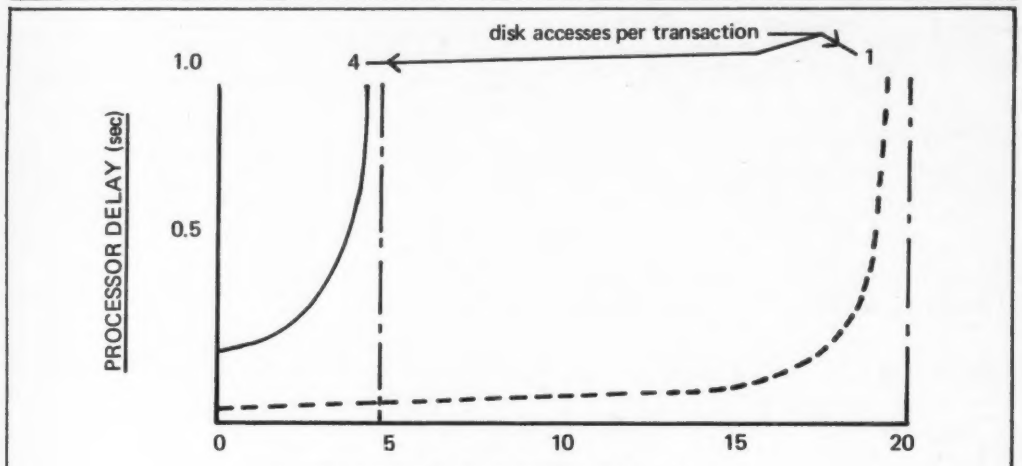


FIGURE 4. EFFECT OF AVERAGE THROUGHPUT RATE ON RESPONSE TIME

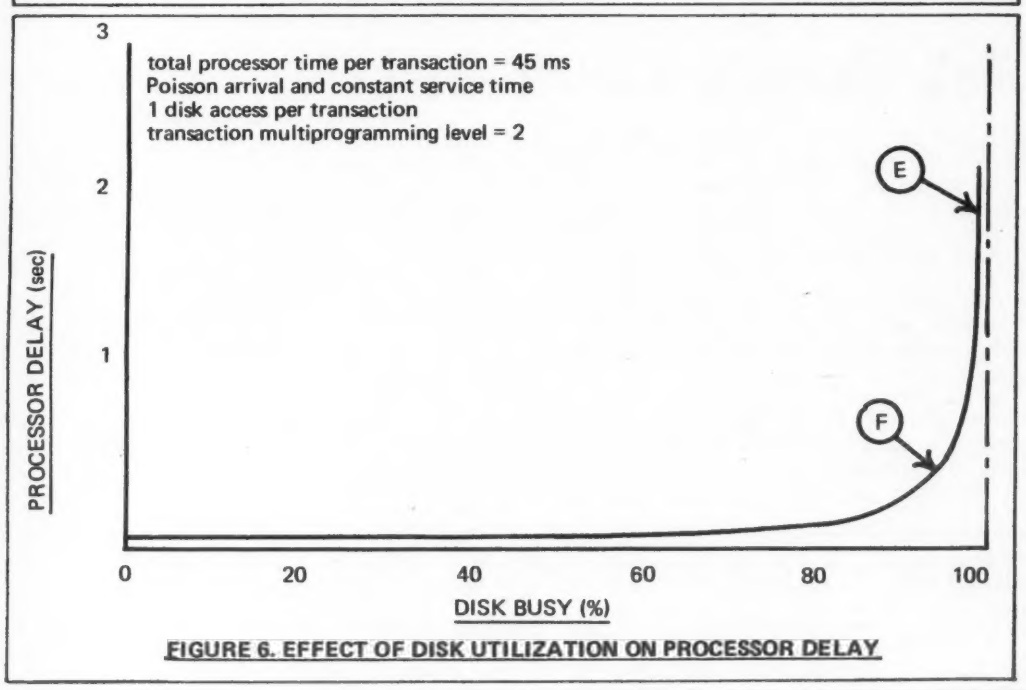


FIGURE 6. EFFECT OF DISK UTILIZATION ON PROCESSOR DELAY

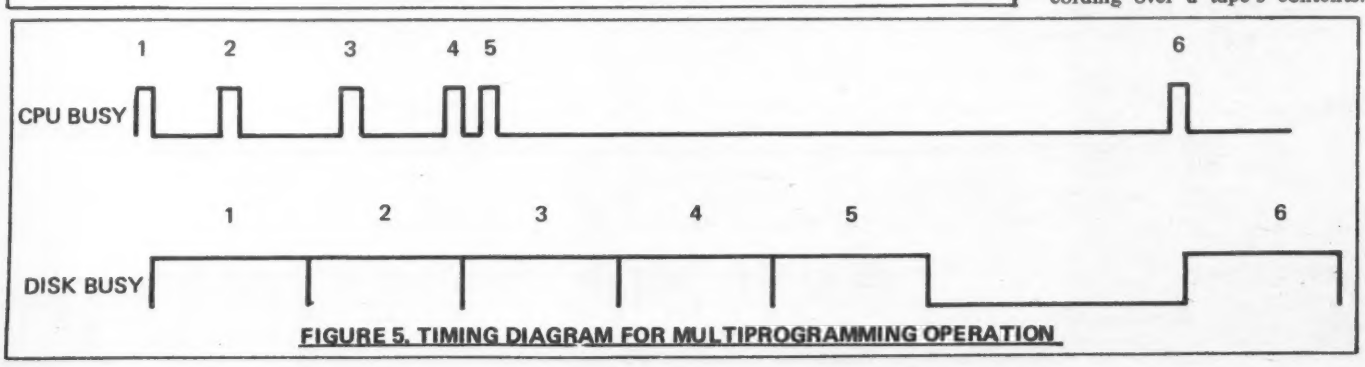


FIGURE 5. TIMING DIAGRAM FOR MULTIPROGRAMMING OPERATION

Disk Devices Can Yield 90% and More Efficiency

(Continued from Page 41)

It is the determination of the location of this knee of the curve that is the important value in developing such figures.

From the figure, the two-second delay requirement is reached when the disk is 89% busy. As a practical matter, the operational capability would be set at the knee of the curve which is 85% busy.

More Complex Application

Next, consider a somewhat more complex application in which all the conditions are the same as for the first example except each transaction requires four disk accesses and five 5-msec CPU periods.

Figure 2 is a timing diagram for this application. The time per transaction is 180 msec disk time and 25 msec of CPU time totaling 205 msec per transaction.

If one transaction were processed every 205 msec, the disk would be busy 180 msec of each 205 msec or 88% – the maximum possible utilization for this disk.

Figure 3 indicates the calculated delay within the computer. The knee of the curve is at 80% disk busy which would again be used as the operational capability, even though the two-second delay would have been met at 83% busy, Point C.

Figure 4 illustrates the difference between the two systems discussed when viewed from the transactions per second processed viewpoint.

Two Transactions

Having briefly examined serial processing of transactions, the one access per transaction system described above is now examined assuming two copies of the application program are in memory or the application is reentrant.

Two transactions can be processed in a multiprogrammed mode. The timing diagram is shown in Figure 5.

Because the CPU processing for one transaction can be overlapped with the disk transfer for a second transaction, the disk can be utilized to a maximum of 100% busy.

The maximum transaction rate within the processor is one every 45 msec. As the rate of input transactions approaches the maximum, a queue builds up for the disk.

Figure 6 illustrates the effect of disk busy on processor delay. Between 98% and 99% disk busy (Point E) the processor delay reaches the 2 second requirement.

For this system, the practical operational capability of the disk is about 94% busy which is the knee of the curve, Point F.

Operations More Complex

In practice, the processing operations are usually more complex than those described. However, I have found simple queuing considerations adequate to develop utilization guidelines for disk devices and CPU as well as the other system components.

Actual measurements on operational systems have shown disk devices can be satisfactorily used at about the calculated operational capability. Satisfactory operation with disks 90%-plus busy have been measured on heavily loaded systems.

It should be emphasized that a considerable depth of knowledge and understanding are needed to effectively utilize the methodology.

Stimler is an independent consultant located in Moorestown, N.J. 08057.

Cassette Works at Rugged Sites

ST. PAUL, Minn. – The No. 834 Certified Digital Cassette from 3M Co. features an enhanced oxide component to achieve high signal output and increased environmental stability, the vendor said.

The enhanced magnetic coating does not soften at high temperatures or become brittle at low temperatures, a spokesman said.

Exceeds NBS Standards

The unit's signal output exceeds National Bureau of Standards standards for reference and standard tapes by 20%, he added.

Ansi-standard "write enable" plugs are optional to prevent recording over a tape's contents.

The cassette costs about $6 with quantity discounts available, 3M said from the Data Recording Products Division, P.O. Box 33600, St. Paul, Minn. 55133.

Cummins-Allison 4216 Gets OCR Capability

GLENVIEW, Ill. – Cummins-Allison Corp. has added a dual optical character recognition (OCR) read capability to its Model 4216 reader/sorter, the vendor said.

Simultaneous Scanning

The feature allows two OCR printed lines to be simultaneously scanned using the company's standard OCR fonts; combined with a magnetic ink character recognition (Micr) reading capability, the enhancement allows speeds of up to 650 document/min to be handled, the firm said.

The 4216 costs $69,750 for a 13-packet reader/sorter with OCR and Micr reading capability. The two-line scanning feature costs $24,750, the company said from 800 Waukegan Road, Glenview, Ill. 60025.

Cleaning, Retensioning System Removes Magnetic Tape Errors

WALTHAM, Mass. – The Kybe Corp. high-speed magnetic tape cleaning and retensioning system is said to remove over 95% of read/write errors from computer tapes.

At 300 in./sec, the E-24 Mod VI system cleans a 2,400-inch reel of tape in less than two minutes and handles a full clean, retension and restack cycle in about three minutes, the firm said.

The system uses two sapphire cleaning blades to remove error causing particles from the tape's oxide surface, restoring precise head-to-tape contact on tape drives, it added.

Three auto-advancing cartridge tissues wipe away particles that adhere to the tape due to static electricity or magnetic attraction. The system also retensions the tape and stacks it on the supply reel, Kybe explained.

The Model VI has features to improve tape retensioning ability including direct drive motors to replace belt pully linkages, CMOS circuitry to control the system and interlocking controls to prevent tape damage from operator error, according to the firm.

A fail-safe breaking system gently stops the tape if the power fails, the firm noted.

The unit costs $2,650 from 132 Calvary St., Waltham, Mass. 02154.

KW Frequency Converter Has Low-Noise Volume

DEER PARK, N.Y. – KW Control Systems, Inc. has a low-noise 415-Hz frequency converter for IBM 370/168 and 370/158 systems, according to a KW spokesman.

The enclosed unit converter features a 55-decibel noise level which is said to be quieter than computer room air conditioning background noise.

The unit can be installed in the working area of the computer room; it rests on a raised floor without fasteners or supports, the spokesman indicated.

In a typical 370 installation, the user will have two converters for one CPU.

Each unit is connected to the CPUs via a manual selector switch or automatic parallel control. With automatic control, the system allows redundant operation of both converter units for multiprocessor applications.

In a multiprocessor setup, three frequency converters are operational with one acting as a spare, the firm said.

The system costs $16,800, the firm said from 151-17 West Industry Court, Deer Park, N.Y. 11729.

In Their 'Spare Time'

COM Systems Help Companies Publish Catalogs

CULVER CITY, Calif. – With the help of computer output microfilm (COM) systems, companies are now able to take computer-stored data and produce book-quality catalogs, according to James Callaghan, vice-president of marketing for Information International, Inc.

Previously, companies with large publication loads had to set their work in type and ship it to a printer who published copies, Callaghan said.

But now, publishing is becoming one more task assigned to the DP center, he added.

Not only is the data more readable, it is produced for less cost and faster. Hence, more and more retailers and manufacturers are becoming publishers in their "spare time," he said.

"The days of time-consuming typesetting, editing and, especially, pasting up galleys into page proofs are disappearing," Callaghan claimed. "Computers are streamlining the process, reducing the time involved while boosting the quality and accuracy of the resulting publication," he asserted.

Now, data is inserted into a computer through CRT terminals. Operators type information on a keyboard and review the text on the screen, typing appropriate changes or corrections on the spot, he explained.

Unlike text produced by typesetting machines, which requires totally new resetting when it is updated or revised, the electronic process involves storing the copy on disks. The text then can be recalled on the screen at any later date and revisions can be made, he added.

A software program within the CPU governs how the text eventually should appear – the type face and size, width of lines; how word breaks at the end of a line should be handled; and how short lines at the top or bottom of a column should be adjusted, he continued.

Disk to Tape Transfer

When the text is ready for publishing, the data is transferred from the disks to magnetic tape and the tape is inserted into a COM system which reproduces the text as complete pages in film form or as page proofs, Callaghan explained.

Printing press plates are derived from these versions for use in publishing, he added.

"One of the major advantages of such systems over previous mechanical operations is the ability to store information in the computer," Callaghan commented.

"In conventional typesetting, one must start from scratch every time a directory, list or manual needs updating or revision. But with the computerized systems, one need only make the changes, additions and deletions to the basic store of information," he explained.

Automobile Publications

For instance, Chrysler Corporation uses a COM system in publishing price and parts lists, directories and catalogs. Previously, the automaker depended on outside vendors for composition and typesetting, according to Callaghan.

Adopting its own system enabled the firm to cut per-page costs for its price lists from $15 to $2. Turnaround time in production is shorter and accuracy is improved, he added.

The Chrysler publications range from a 120-page internal telephone directory which comes out annually to a 3,000-page parts catalog which is the prime source of service and replacement information on chassis parts for cars and trucks.

Also churned out on Chrysler's presses are a 1,200-page master parts price list issued bimonthly, another 1,000-page annual price list and a 2,000-page annual flat-rate manual indicating the serviceability and labor charges appropriate for repair work on Chrysler cars and trucks.

Outside the auto industry, a leading aerospace company uses such equipment to produce technical manuals, catalogs, telephone books, proposals and numerous internal documents.

Lockheed Missiles & Space Co. devised its own software composition program, called Autotext Publication System, to govern production of these publications, according to Callaghan.

Graphics System Gets Enhanced Features

SALT LAKE CITY, Utah – Evans & Sutherland Computer Corp. has introduced an enhanced computer graphics line drawing system.

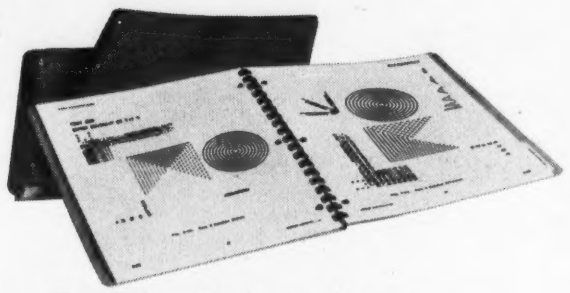
The Picture System 2 is an updated version of the firm's Picture System and both systems are software compatible, the firm said.

The system features a faster update rate, increased line presentation of 21,500 lines per 30th of a second and a larger number of characters.

A standard system with a picture processor, memory, refresh controller, line generator, character generator, CRT, data tablet and work station costs $65,500 including a Graphics Software Package, he said.

Evans & Sutherland is at 580 Arapeen Drive, Salt Lake City, Utah 84108.

"As the first interactive small plotter, it was the only intelligent choice."



The 4662 contains its own character generator, alpha rotation, and page scaling, thus minimizing support software. Proven graphic and plotter software is provided by Tektronix.

Problem: Until now, no small plotter could carry on an intelligent conversation.

Because most B-sized plotters have been pretty much the same: slow, unreliable, and dumb. Even with large off-line plotters you can wait hours, even days, for results . . . and if there's a mistake—start over.

Solution: Tektronix' new microprocessor-based 4662. For interactive plotting, page scaling, digitizing, and camera-ready output. Just $3995.†

The 4662 is the first smart buy among 11"x17" flatbed plotters. Its digital design and vector generation offer exceptional accuracy and repeatability without drift or slidewire dirt build-up. Its 1600-byte buffer lets the host work while the 4662 plots . . . at speeds up to 22 ips.

It's the first B-sized plotter with graphic input. Digitizing capability and built-in joystick mean you can input corrections in seconds, experiment with designs, and run off camera-ready copies practically as fast as you load paper.

It's plug-to-plug compatible with virtually any RS-232 system . . . from minis to mainframes. You can plot circles around any other B-sized plotter, for about the same price as the competition.

Want immediate action on the 4662? Call toll-free: (800) 547-1880.

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Information Display Group
P.O. Box 500
Beaverton, Oregon 97077
Tektronix Datatek NV
P.O. Box 159
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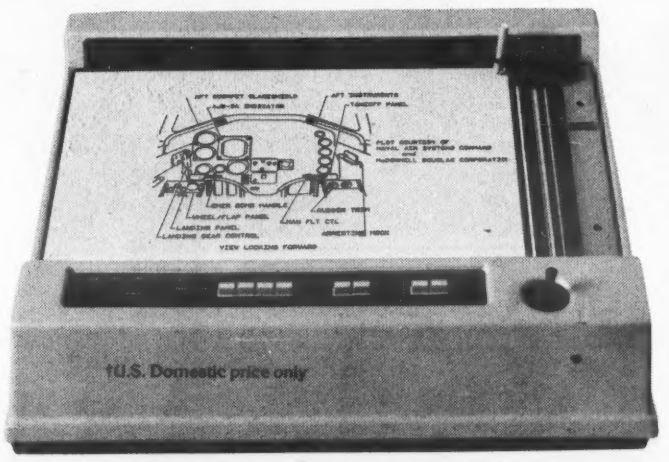

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TEKTRONIX®

Cost of Ownership Major Criterion in Printer Choice

SAN FRANCISCO – "The single most important consideration in the selection of a printer, after basic performance specifications, is the total cost of ownership," according to Ken Freund of Dataproducts Corp.

The most obvious place to start in selecting a printer is with the performance requirements needed "today and in the foreseeable future," Freund told a group here recently.

Questions that should be answered include: What speed machine is required? How many pages of output will be generated over what time frame? What is the typical character density, both horizontal and vertical, which is anticipated?

Can slewing to top of form increase throughput? How many hours per day will the printer be used? Is matrix print quality acceptable? What types of forms will be used – custom or stock – and how many parts?

The total cost includes the initial purchase price, supplies, maintenance and spares over the expected life of the equipment.

"When analyzing competing equipment, it is not unusual to discover that an inherently superior product with a higher initial cost will, over its life, incur a lower total cost of ownership," Freund said.

Maintenance Costs

Printer life-cycle cost analysis requires consideration of the mean time between failure of the unit, based on the basic construction of the printer, he said.

If the unit is not soundly designed, maintenance can become a costly problem. The simpler the design, the more reliable the unit, he claimed. If a unit is designed simply, it should require a minimum amount of maintenance, he added.

Users with volume printing requirements should not use printers needing special paper unless some other overriding consideration, such as plotting capability, is involved, he noted.

Applications requiring multiple copies incur significant additional expense if secondary reproduction techniques must be employed.

Ribbon expense can also become substantial over the life of the printer and users should consider the anticipated ribbon life, Freund said.

Consider Print Quality

Print quality is another area users should consider when purchasing a printer. "The basic objective of good print quality is to have output which can be easily and accurately read." Individual characters should not be fuzzy, misregistered or have background clutter, he added.

If a user plans to use a form or print paper, he should request print samples be run using his paper with both new and used ribbons, Freund emphasized. If multipart forms are to be used, additional samples should be requested to assure an acceptable last copy, he said.

Users should also make sure the printer conforms to local and state governmental codes for safety purposes.

Operator Acceptability

Operator acceptability is another area many users overlook when selecting printers, Freund said.

"Loading should be easily accomplished in a minimum of time without awkward physical contortions on the operator's part," he said.

If pin feed paper is used, tractor face plates should be exposed and the tractor teeth should be clearly visible when loading the paper. Paper tension between tractors should be adjustable while the printer is running, he added.

Simple Controls

Controls should be simple so "as many control functions as possible" are performed automatically. Those that are present should be labeled, he said.

To allow operators to identify system problems and initiate corrective action, an indicator panel which identifies the condition of major printer subsystems, rather than just registering an alarm, should be included. By distinguishing operator correctable faults from those requiring technical expertise, unnecessary service can be eliminated, he explained.

Quiet operation is another consideration since printers are sometimes placed in working environments rather than in computer rooms, he noted.

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For 32-Bit Minis

Non-Local Shared Memory Introduced by Interdata

OCEANPORT, N.J. – The Interdata, Inc. Multiport Memory System allows up to 14 32-bit minicomputer CPUs to share up to 870K bytes of nonlocal memory as an "alternative to the large mainframe approach," according to a vendor spokesman.

Operating with Interdata 7/32 or 8/32 CPUs, the core memory runs under Interdata's most recent release of the OS/32MT multitasking operating system. The operating system of each processor in the configuration treats the multiport memory as an extension of its own local memory, the spokesman explained.

The operating system provides for discontiguous memory support and multiple Task Commons to allow for the configuration of the non-local memory, the firm added.

Shared Memory Limited

The amount of shared memory in the system is limited by the processor in the configuration with the largest complement of local memory; if the largest local memory is 256K bytes, total Multiport Memory is limited to 744K bytes, the spokesman explained.

All Interdata CPUs can directly address 1M byte of memory, he added.

Memory modules are available in 32K-byte blocks with a 750 nsec cycle time and 64K-byte blocks with a 1,000 nsec cycle time. The shared memory can be used in contiguous, half-word interleaved or full-word interleaved mode.

Each multiport memory bank consists of up to eight boards of memory; the largest bank contains 512K bytes. The multiport memory controller allows either "round-robin or fixed-priority access to memory," Interdata noted.

A system is configured by connecting an extended direct memory access bus and an interface to each CPU. A pair of interfaces is connected to a single multiplexer, which is attached to the controller located in the memory bank. The processors are then assigned priorities, Interdata said.

Typical multiport applications include aerospace simulation system design and electric power distribution, the vendor added.

The largest configuration with 14 processors can contain eight memory banks with a total of 112 I/O ports. Each memory bank operates asynchronously and independently of others in a multiple memory bank system with multiple memory uses.

Aggregate throughput rates can exceed 20M byte/sec because a CPU can transfer data from a storage device into multiport memory while simultaneously accessing local memory, the firm said.

A one-bank, two-port contiguous 64K-byte system costs $18,600; a four-bank, two-port system with 128K bytes of memory costs $54,500. Interdata is at 2 Crescent Drive, Oceanport, N.J. 07757.

IBM Extends 3/12 Memory

ATLANTA – IBM 3/12 users can expand their system's memory up to 96K bytes with two additional memory sizes for the system introduced recently.

An 80K-byte memory capacity was also announced.

The memory sizes were designed to give users "greater flexibility in running both batch and on-line interactive programs concurrently," an IBM spokesman explained.

Current 3/12 users can upgrade to the increased memory sizes, which will be available in June 1977, in the field, he added.

To go from a B18 – the 3/12 with 64K of memory – to the C19 with 80K of memory will cost $8,350; to upgrade from the B18 to a C20 with 96K bytes of memory will cost $11,050. The total time for an upgrade is less than eight man-hours, IBM said.

The 3/12 CPU with 80K of memory will cost $64,215 and rent for $1,862/mo under the Monthly Availability Charge (MAC) or $1,693/mo under the Term Availability Plan (TAP). The 96K-byte 3/12 will cost $66,915, $1,967/mo under MAC or $1,788/mo under TAP.

Small System Solves Big Business Woes

By Esther Surden
Of the CW Staff

DALLAS – A minicomputer at Burgess Industries, Inc. here is solving the large business problems typically encountered by small- to medium-sized businesses who can't afford the mainframe approach, according to Benjamin R. Peek, a consultant to the firm.

Burgess has multiple operating divisions, a retail/wholesale distributed network of stores, multiple manufacturing facilities and sales offices. The firm has been in business for over 40 years and has a mix of older managers and new aggressive management as well as a mix of new products and mature product lines, Peek said.

Burgess had reached the point where its manual information system had become expensive, late and prone to error; with sales at $40 million, however, the firm could not consider a mainframe system because of cost.

A large staff of programmers to support a large-scale system was also not affordable by the firm, Peek emphasized. Management had decided the cost and risk involved in trying to develop a programming capability in-house was beyond reasonable business risk.

"Almost the only alternative to the Burgess kind of company is the mini/micro approach, but only if the software can be made to conform to Burgess business procedures and if software costs can be structured within the economic resources of Burgess as a reasonable business risk," he said.

Determining the Risk

Burgess determined its risk by equating the entire system cost to the salaries it would have paid and extrapolating potential benefits such as the ability to quote against customer requirements. It found it could recoup the system investment in less than 10 months, Peek indicated, with a hardware investment of $139,000, a software investment of $20,000 and about $13,000/mo for the first year in additional software costs.

The major problem with any information system being developed, Peek said, is the proper implementation of a philosophy of operations which incorporates standards for analysis, data base design, programming, testing, documentation, maintenance and operations of the information systems function.

The firm took the four months before the system was delivered to develop this and write some applications programs.

The philosophy that emerged at Burgess specified:

- The system would be transaction-driven and run in real-time with the user interfacing through a CRT. The CRTs would be easy to use by non-DP-oriented people.
- All reports would be controlled locally and printed on demand of the user.
- All the applications would share a common data base.
- Company business procedures would be reviewed and revamped to optimize ways of doing business and to conform with actual data flow.

It was also assumed the system's center would also be a profit center, Peek noted.

System Configuration

The Burgess staff has only six people, three Burgess employees and an average of three consultants. A Varian V75, delivered last January, includes a CPU with 128K words of semiconductor memory, 100M bytes of disk, 300 line/min printer, data communications multiplexer, Houston Instruments plotter and various CRTs and remote printers.

Software includes the Vortex II operating system, Vortex Telecommunications Access Method, Fortran IV, Cobol, RPG-II and RPG-IV, Cincom Systems' Total data base management system, Basic and Assembly language, he said.

(Continued on Page 51)

Diablo 3200 Business System Features Micro-Based CPU

BURLINGAME, Calif. – The Diablo 3200 from Shasta General Systems is an Intel 8080-based system designed for small business users.

The microprocessor-based CPU, manufactured by Diablo Systems, Inc., features a 500 nsec random access memory of up to 65K bytes which is shared by applications programs, a diskette-based operating system and other system software, the firm said.

With direct memory access capability for both CRTs and diskettes, the system can accommodate a range of Diablo peripherals, a spokesman added.

Both standard and word-processing versions of the Hytype II printer, the Diablo 200 char./sec matrix printer, dual diskette drives, a 1,920-character CRT and the Diablo Series 400 drives which will be available next year can attach to the 3200, he said.

Application software includes order entry, invoicing, accounts receivable, accounts payable, general ledger, inventory control and payroll programs. The system is programmed in a language described as a high-level compiler similar to extended Basic which works with a resident interpreter.

A 3200 with 3M characters of on-line diskette storage, a keyboard/CRT console, the word-processing version of the Hytype II printer and applications programs costs about $25,000 depending on the number of applications involved. Shasta is at 895 Stanton Road, Burlingame, Calif. 94010.

Minicomputer Maintenance Service Not Terrible

By Paige L. Chilson
Special to Computerworld

I disagree with many of the statements made in the article "Mini Service Not Too Good" by Jon David [CW, Oct. 4].

For example, the quote "if a printer goes down, a disk goes down or whatever, the entire system is effectively unusable," should have been explained in more detail. The only time a complete system becomes unusable is when the CPU itself goes down.

Minicomputer Exchange

Minicomputers are harder to operate and require more human intervention and more computer knowledge than their larger counterparts.

Normally minis are bought as a cost option to the larger systems and are placed in businesses where the operational responsibilities fall on one person who also has other responsibilities in the firm.

Minis are always undersold and underconfigured. Because cost becomes an important factor, an inferior system is purchased.

If a printer goes down, it is seldom down hard (100% out of operation) and even when it is completely out of operation, the system is still not "effectively unusable."

I still can input my data update records, manipulate files and read information out to the console which constitutes 80% of the work I am trying to accomplish. If I have a service contract with a reputable maintenance firm; my printer is back in operation within a short period.

"Minicomputer maintenance is probably the weakest area . . . " is another statement with which I disagree.

Weakest Area

Problem determination is, I believe, the weakest area in the entire minicomputer field; many software malfunctions are contributed to hardware failure and the reverse is also true.

Software maintenance, proper documentation of system operations and user oriented training as to what the program is attempting to accomplish (not what the user believes the program is doing, but what actually was written by the programmer) is as important as the proper hardware maintenance team.

Intermittent hardware or software problems play a large role in the inconsistencies of minicomputer maintenance and directly relate to problem determination.

The service company is called to fix the problem. Three or four hours later, the customer engineer (CE) arrives, works on the problem for two or three hours and cannot get it to fail using approved diagnostics and the problem does not occur again.

The CE says there is no problem or announces he fixed it and goes on to his next call.

The machine is neither fixed nor has the problem been determined, but the problem will return until the software or hardware bug is fixed.

The comment, "A maintenance person gets familiar with a piece of equipment just in time to see it discontinued," is another misleading statement.

I became familiar with printers, disk drives, tape drives, CRTs, card readers, etc. 10 years ago and they are still around today.

I admit there have been many changes to enhance the disk drive, but the basic philosophy of the disk remains the same and a good maintenance person need only be "brought up to date."

David referred to servicemen being taken from one company to the next and service departments hiring the best personnel they can from their competitors. He said this hurts the minicomputer industry. He also said the minicomputer industry suffers from an environment with considerable maintenance force turnover which hurts customer service.

Why single out the minicomputer industry? The minicomputer service work is only as reliable as the people you are dealing with, which is the same as with large systems.

When Comma Corp., Control Data, Raytheon, Sorbus, Itel and many more companies went into the IBM third-party maintenance business and hired CEs from IBM, did IBM provide poor service or fail?

The statement, "Since service is not done on a contract basis with the manufacturer, requests to the manufacturer for replacement parts normally get lowest priority, so even the most trivial repair may require a system to be down for an extended period," is out of proportion to the state of the art in minicomputer service today.

All good OEMs and third-party maintenance organizations stock the required amount of spare parts to bring the system back up within two or three hours.

Readers are urged to reply to this or any other Minicomputer Exchange article. This is your column, a chance for you to exchange views on the various topics confronting the minicomputer user, a chance to tell the vendors what you are thinking and to let your fellow mini users know about pitfalls or new techniques in this area. Letters or manuscripts should be addressed to Minicomputer Exchange, Computerworld, 797 Washington St., Newton, Mass. 02160. Double space, please.

If you have to spend the additional money and time to end up with a system as outlined in the last paragraphs of the article, then you are doing something wrong and defeating the purpose of minicomputers. If this is the case, perhaps you could buy a system from IBM and save money.

A few final thoughts on selecting your service company:

- A third-party maintenance company must be independent; it cannot be part of a parent company that manufactures computer products. Taking care of their own products will naturally have priority over taking care of you.
- A service organization cannot be responsible to a marketing division of a company.
- Selecting your maintenance team is as important as selecting your computer. Check the company to ensure they have the software and hardware maintenance capabilities you require.

Chilson is a consultant for the National Association of Letter Carriers Health Benefit Plan in Reston, Va.

Despite Institution Sizes

Oregon Hospitals Use Small Systems

PORTLAND, Ore. – Two hospitals in this metropolitan area have found they are able to use a small business system despite differences in their sizes, according to Robert W. Vial, director of fiscal services for both facilities.

The hospitals are separate and independent but geographically proximate nonprofit facilities, Vial noted.

Dwyer Memorial, located in Milwaukee, Ore., eight miles from here, is a 70-bed general acute-care hospital. Holiday Park Hospital, in downtown Portland, is a 195-bed acute-care facility.

On Vial's recommendation, each of the hospitals now has its own IBM System 32 and is using IBM's Hospital Financial Management System Industry Application Program (IAP).

Expectations Satisfied

"Results so far have completely fulfilled our expectations at smaller Dwyer Memorial and are equally pleasing at Holiday Park, which has two and a half times the bed capacity and patient volume," Vial said.

"Since the System 32 went in, business operations are more efficient, ancillary service revenues are higher, cash flow is swifter at Dwyer and financial controls are tighter at both hospitals," he reported.

Before the systems were installed, Holiday Park was posting patient records and billings manually. Dwyer Memorial was using a computer service for patient billings, accounts receivable and payroll processing.

Holiday Park Hospital only had computer service for payroll.

'Something Better' Needed

"By late 1974, it was apparent that something better in the way of DP systems was needed if we were to ensure the operating efficiency and gain the management control we wanted," Vial explained.

"Our initial aim was to find a single system that could be shared by the two hospitals, would be reasonably economical and capable of both automating basic hospital business routines and furnishing timely management information.

"However, when IBM announced the System 32 in January of last year, we found we could give each hospital its own in-house system at a lower cost than the single, shared system we had contemplated.

"Our only worry, which has since proved groundless, was that the System 32 might be too small to handle the larger hospital's heavier workloads," Vial recalled.

Conversion to the system was a bit more time consuming at Holiday Park than at Dwyer Memorial. But this had nothing to do with the differences in bed capacity and patient volume, according to officials.

Both On a Par

"We were converting from a total manual system, and had to build the necessary record files from scratch, while Dwyer Memorial already had created the record files for their computer service applications," Jerry Harley, Holiday Park's controller, explained.

Currently, both hospitals are on a par in implementation of the Hospital Financial Management System IAP. Patient billing, accounts receivable, accounts payable and payroll are up and running, and general ledger will go on the system shortly, according to Vial.

The patient billing program tracks patient transactions on a day-to-day basis, updates the records to reflect current status, captures all applicable charges and then provides necessary management information that was not available before.

"Service revenues have increased because a system of this type will pick up patient charges that might otherwise be missed in a manual system.

"Financial control is improved because of the timely reports the system provides, such as the aging analysis of accounts receivable and labor distribution analysis," Vial said.

At Dwyer Memorial, billings now get out within three days of the patient's discharge instead of up to 15 days with the old system.

Computer aging and reporting of overdue receivables also has a favorable impact on cash flow and the system is capable of accounts receivable agings on a variety of bases.

Wangco Offers OEM Disk Drives

LOS ANGELES – Wangco, Inc. has introduced a series of OEM disk drives for minicomputers which are said to store 5M-, 10M- or 20M bytes of data in the space usually required for a 2.5M-byte drive.

Dubbed the "Super Generation," the drives are available in top-load Super T or front-load Super F models, the firm said.

The Super T uses an IBM 5540-type cartridge in combination with a fixed disk and offers data densities to 4,400 bit/in. with up to 200 tracks per inch for a total capacity of 20M byte/drive, the firm said.

The Super F, which uses IBM 2315-type cartridges, provides up to 2,200 bit/in. or 10M bytes of storage with transfer rates to 2,500K byte/sec, the firm added.

The reduced size of the drive is a result of a "side throw" voice coil positioning system, Wangco said. A magnesium positioner speeds access time so random average seek is 33 msec, the firm noted.

Other features include a filter forced air cleaning system, daisy chain and unit select capability of up to four drives as well as precise internal temperature compensation.

In OEM quantities, the 5M-byte unit costs $3,100; 10M-byte unit, $3,575; and 20M-byte unit, $4.470, the firm said from 5404 Jandy Place, Los Angeles, Calif. 90066.

IBM Adds Printer, Print Plot Library For 5100 Systems

ATLANTA – IBM has added another printer and a print plot/problem-solver library for use with the 5100 portable system.

The 5103 printer operates at 120 char./sec and is a 132-print-position matrix printer. It can handle single or multiple copies as well as continuous single or multipart paper, according to a spokesman.

With the library, users can use the 5100 with either the 5103 Model 1 or Model 2 printers as a plotting output device, he noted.

The library allows production of line graphs, histograms, bar charts and point-to-point plots. The graphs can be produced either from program-generated data or from data entered directly at the system's keyboard, IBM added.

Users can now use the 5100 with vector plotters and CRTs when a serial I/O adapter is added, he said.

The 5103 Model 2 costs $4,175. The library is available in either APL or Basic and costs $500, according to the spokesman.

Both will be available in November, he said from IBM's General Systems Division in Atlanta, Ga. 30301.

Small System Solves Large Business Woes

(Continued from Page 48)

Currently Burgess has several systems on-line with more to be developed, Peek noted.

The personnel information system was designed around an employee "master data set" containing general employee information and educational and training data as a subset, he said.

It provides information on an employee's work history including a specific list of skills, merit review data, vacation log, pension plan data and accounts for all the company-paid insurance benefits. This system also keeps track of all travel expense data.

The applications engineering systems are primarily used for product design and optimization. The system keeps track of Industrial Silencing vessel design including flow rate, noise and calculations by job or environmental specifications. Other products are also tracked by this system.

The bill of materials system allows design engineers to create families of parts, define a "standard" descriptive parameter hierarchy, generate hard copy of all possible parts and develop the physical bill of materials using standard descriptions.

The estimating system allows management to extend the bill of materials against "estimated, standard or average material costs" contained in the inventory data base.

An inventory control system tracks parts by job and location, consolidates purchasing for many jobs and processes bills of materials by job.

The corporate planning systems project sales by division seven years into the future and calculate gross margin nets of production fixed costs.

CI Notes

Calcomp Realignment To 'Sharpen Focus'

ANAHEIM, Calif. – California Computer Products, Inc. (Calcomp) has realigned its major product elements into two main product line divisions.

A Graphics Products Division and a Memory Products Division have been created in order to "lend sharpened focus and direction to company efforts," according to George M. Canova, Calcomp president.

Each division will have its own engineering, manufacturing, quality assurance and product marketing responsibility, he added, with centralized operations already in place providing sales, field engineering and financial/administrative support.

H. Eugene Brewer has been named to head the Graphics Products Division while James Y. Payton will head the Memory Products Division.

Graphics Products will be responsible for all traditional graphics equipment such as plotters, plotter controllers and computer output microfilm systems, Canova said. Memory Products will focus on Calcomp disk and tape drives and controllers, the Automated Tape Library and related products.

Base, HIS Sign Agreement

NEW YORK – Base Information Systems, Inc., a subsidiary of Advanced Computer Techniques Corp., has signed a letter of intent with Honeywell Information Systems, Inc. (HIS) for a sales/service agreement.

Under the agreement, Base will offer its Ultratext System and the HIS Level 6 minicomputer as a packaged system.

Honeywell will acquire certain software license rights to the Base word-processing system and will provide installation and maintenance services to users.

Supershorts

TRW, Inc. plans to form a joint venture in France with Matra S.A. to distribute U.S. DP equipment marketed internationally by TRW Datacom International.

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Memorex Corp. has named Moore Business Forms, Inc. as a distributor for three disk products: top- and front-load disk cartridges, IBM-compatible flexible disks and Data Mark data modules.

Measurement Revamped in '69

'Yardstick' Reduced IBM Market Share

By Edith Holmes
Of the CW Staff

NEW YORK – IBM may have sabotaged its own market share figures in the late 1960s because its management and legal counsel knew previous measurement policies revealed the corporation had a monopoly share, internal IBM documents suggest.

Introduced at the U.S. vs. IBM antitrust trial here, this group of some 32 documents, including the deposition testimony of six IBM executives, also indicate the corporation changed its methods for measuring its position in the computer industry at about the time the government filed suit in January 1969, the Justice Department hopes to show.

IBM counsel argued, however, that this effort to revise share figures, eventually called "Project Yardstick," was no more than an attempt to improve on IBM's field reporting system for learning about competitive successes and to include increasingly competitive products like communications devices, OEM equipment and add-on memories and other peripherals in its definition of the market.

IBM Trial Documents

As such, Yardstick was not created to answer the government's charge that IBM is a monopolist, the defense is maintaining.

The effect of Yardstick was to substantially lower IBM's estimate of its market share. Yardstick essentially broadened IBM's definition of that marketplace and caused the corporation to consider as its net position share only those machines it rented and therefore still owned, the documents show.

Using this scheme, IBM calculated its June 1969 standing as 48.7% of the market, for example, according to a September 1969 memo addressed to the IBM corporate director of marketing, then Ralph A. Pfeiffer.

"The erroneous old net position share for this time period would have been 71.2%," this document continued.

One document, entitled "Yardstick Very Net," sets out the chronology of IBM's use of competitive measurements. Written in part by Pfeiffer's administrative assistant, Donald Sisson, the exhibit indicates IBM's corporate vice-president of marketing, R.W. Hubner, first questioned the corporation's 85% market share in 1965.

To a man, those IBM executives asked about IBM measurements of competitive activity testified in depositions that IBM's field reporting system, called "Comstat" for "Competitive Statistics," was inadequate and unreliable.

Dependent on the sales force to report

(Continued on Page 54)

Cassette Seen Retaining Edge In Magnetic Recording Market

By Toni Wiseman
Of the CW Staff

WELLESLEY HILLS, Mass. – The cassette will retain its leadership position as the most popular low-cost magnetic data recording device through 1980, according to a recent study by Venture Development Corp. (VDC).

While predicting growth for cassettes, 3M cartridges and floppy disks, the study said cassettes, the lowest-priced medium in absolute terms, will continue to account for most units sold through 1980.

In 1975, cassettes accounted for 73% of the market for low-cost data recording devices, cartridges for 5% and floppies for 22%, according to the study. By 1980, cassettes will have 52% of the market, cartridges 8% and floppy disks 40%, it predicted.

"The world market for cassette drives will expand at a 16% annual rate through the next five years as the European and Japanese computer industries expand at a faster rate than U.S. markets (from a smaller base)," the report stated.

The average annual growth rate for foreign cassette markets will be 25%, VDC forecast, while the world market volume for 3M cartridge drives will increase at an average annual rate of 38% and floppies at a 40% rate.

The dominant medium remains the Philips-type cassette, VDC said, predicting the U.S. market for cassette drives will continue to grow at an average annual rate of 12% through 1980.

The 3M cartridge, which is the only other self-contained magnetic tape package to obtain industry acceptance, has had only limited success and has been unable to compete in the minicomputer-based applications market, according to VDC.

The floppy disk, on the other hand, is the cassette's principal competitor, "making considerable inroads in minicomputer-based applications," the study added.

"The digital cassette started with a bad reputation, but is beginning to live it down," the report said.

VDC found there are 20 producers of cassette drives who sell them on the open market; 10 more make drives for their own use. Less than half as many companies produce 3M drives as produce cassette drives, yet there are no large companies marketing cassette drives, VDC noted.

On the other hand, a number of large companies compete in the floppy disk business, VDC pointed out.

(Continued on Page 56)

Ansi I/O Standards Approaching Reality

WASHINGTON, D.C. – The proposed input/output interface standard based on IBM gear has moved a step closer to reality.

The American National Standards Institute's (Ansi) X3T9 technical committee has voted to forward the channel level and power control specifications to the user-oriented X3 committee as well as to the International Standards Organization, according to Del Shoemaker, X3T9 chairman.

The X3T9 group will now consider the operational characteristics of the interface for tape and disk drives as well as I/O terminals, he said.

Progress on this last item should move at a faster pace than on the previous two aspects of the standard, he said.

The X3 committee will poll its members

(Continued on Page 55)

Despite '75 Revenues, FM Losing Early Glamour

WALTHAM, Mass. – Facilities management (FM) revenues totaled $415 million in 1975, about 13% more than its primary alternative, computer services, according to *EDP/Industry Report* (EDP/IR), published by International Data Corp. (IDC).

About 1.6% of total DP industry spending went for FM, EDP/IR said, noting an IDC study found the only major segment of the FM market destined to grow faster than the computer industry as a whole is that which specializes in industry-specific contracts.

Within that segment, the areas of most significant potential growth are the state and local government market and the educational market, it said.

"Although IDC expects FM growth to continue, at a modest 15% a year to $820 million by 1980, the industry has shed some of the marketing glamour it sported earlier in the decade," EDP/IR said. The newsletter noted:

- "Profits have provided difficult to achieve with increasing numbers of FM suppliers – including the one-time leader, Electronic Data Systems – moving to the shared computer, or data center, approach in efforts to maximize the revenue from each investment dollar."
- "Contract renewal rates are poor, forcing vendors to scramble for new customers just to maintain revenue levels. Many of the current users of FM interviewed by IDC had no plans to renew existing contracts."
- "The emergence of distributed processing with on-site minis for immediate processing requirements is beginning to look good to the suppliers of computer services, causing them to examine the merits of providing true FM services."

EDP/IR reiterated a statement it made three years ago, saying the quote still holds true: "The essential flaw in the classic FM concept is that DP is an integral part of a user's operation – unlike such tacked-on problems as feeding the employees or cleaning the halls.

"Though FM has proven to be an appropriate way to handle relatively standardized types of work in some fields – such as banking, insurance and government accounting – experience has also shown expertise in computing is no substitute for an intimate knowledge of a company's operations when it comes to running the DP department, EDP/IR said.

Three Submarkets

IDC distinguished three separate submarkets within the FM marketplace: Federal government FM; custom-commercial FM; and industry-specific FM, EDP/IR noted.

In 1975, the Federal government was the biggest buyer of FM services, spending $200 million or just under half of the total market revenue, according to IDC figures.

Growing Segment

This segment will continue to grow, but by 1980 will have dropped to 40% of the total market with revenues totaling $325 million, EDP/IR reported.

"Because of an expected slowdown in the emergence of new full-blown government computer installations and the entrenchment of civil service personnel at existing computer sites, FM business is expected to show slower growth than in the past," it explained.

Custom-commercial contracts, which accounted for $30 million in 1975, are also on the wane. By 1980, IDC predicted, this market will be only about $15 million.

The only real expertise an FM vendor can bring to the custom-commercial client is the ability to manage an efficient DP center and attract good people, EDP/IR said.

This accounts in great part for the decline of the market, since contracts are often not renewed once the center is running effectively.

This leaves only industry-specific FM as growth area. While these contracts are often as customized as custom-commercial ones, the vendor can take advantage of "learning curve" experiences which hold over from contract to contract, EDP/IR said.

In 1975, industry-specific FM revenues totaled $185 million, or 45% of the total market. IDC predicted that by 1980 this would grow to $480 million or 58% of the total.

CMI Lease Base Sold 'Over Book Value'

BEDFORD, Mass. – Cambridge Memories, Inc. (CMI) has consummated the previously announced sale by CMI's leading subsidiary of its lease base of add-on memories for a price "substantially over book value.

"The lease base sale was the most significant of several actions which we have planned for restoring CMI to a sound financial position," according to Joseph F. Kruy, CMI president.

The purchaser was Electronic Memories & Magnetics Corp.'s (EMM) Systems Equipment Division, a newly organized leasing company which will be managed by EMM.

CMI's present purchase base of over 500 installations will continue to be served and supported by CMI. The maintenance of the total equipment base will be performed by Raytheon Service Co. with support from CMI.

The sale discharged approximately $12.4 million of the CMI leasing subsidiary's debt, although the parent company has a contingent obligation to pay up to $1.5 million in mid-1980 to its lending banks if payments to the banks by the EMM's Systems Equipment Division do not meet certain levels, the firm said.

Total indebtedness to the lending banks, exclusive of the contingent obligation, has been reduced from about $17.2 million last July to approximately $1.9 million, CMI added.

CMI reported a loss of $1.9 million or $1.11 a share for its third quarter ended May 29 compared with earnings of $103,000 or 6 cents a share in the year-ago period.

Revenues in the quarter were $5.779 million compared with $5.777 million in the same period last year.

For the nine months, CMI suffered a $2.5 million loss compared with earnings of $251,000 or 15 cents a share in the year-ago period.

Revenues for the nine months were $17.4 million compared with $16.7 million in the corresponding period last year.

Documents Show 'Yardstick' Cut IBM Market Share

(Continued from Page 52)

business lost to competition, Comstat partially relied on these people to report their failures to management. The series of transfers of this information from the branch and then the regional offices further decreased the accuracy of Comstat numbers, Pfeiffer said in his deposition.

In 1967, IBM attempted to adjust Comstat figures in hopes of making them more accurate, according to Sisson's memo. Corporate marketing and economics groups set up a model for adjusting statistics on the IBM 1620; funds for the project came from G.B. Beitzel, then president of the Data Processing Division (DPD). But, apparently, it went no further.

It wasn't until nearly two years later – in January 1969 – that the IBM director of business practices, F. Cummiskey, presented a definition of the "total information-processing market" to the corporation's Management Review Committee and was told to correct this definition where it was "deficient" in competitive information.

Started in 1968

In March 1968, Hubner formed a task force "to outline a workable and appropriate method of measuring and tracking business volume trends in the DP industry." This was Project Yardstick and, according to Sisson, it had the approval of top executives at the corporate and DPD levels.

Just a month later, IBM was called by the Justice Department to produce a statement on market power in the computer industry.

Sisson's memo stated this study "pointed out the need for changes" in measurement methods and noted IBM's outside counsel, Cravath, Swaine and Moore, and its in-house vice-president and general counsel, Burke Marshall, "agreed changes were desirable."

Hubner directed Beitzel to implement broader market measurements as soon as possible and to include in the market definition competitive add-ons, terminals and control units and bookkeeping machines. Disk drives, disk packs and tape drives would be incorporated into these measurements later, Sisson reported.

"This new concept method is the way IBM's case is going to be presented in Washington," another document stated.

Rented Equipment Only

The plan which IBM's attorneys agreed to was based on its economists' contention that only rented equipment should be counted in IBM's measurement of its position.

Competitive equipment was to include not only machines made by other manufacturers, but IBM devices then owned by users and leasing companies as well, according to a memo to Hubner from Morton Zemen, corporate director of marketing analysis.

The IBM economists suggested the standard net position share contained "irrelevant information because it goes back too far in history and includes machines we no longer own," Zemen wrote. The economists also maintained this "ownership concept" would be a better means for calculating position share and that it need not conflict with the notion of "sales share," he added.

"From an economic and legal point of view, their definition might be accepted," Zemen told Hubner. "More important from corporate marketing's point of view is the possible requirement to put this concept to work to help run the business.

"Here I have severe reservations," Zemen continued. "It seems to me that we should completely abandon any kind of position share, rather than utilize their concept for marketing purposes.

"We could still have a sales share and gauge our progress in various areas by displaying the trend of this sales share over the past few years," he said.

Zemen was not alone in his reservations. Other documents from this time period indicate Hilary A. Faw, then director of corporate business practices, also believed position share data was best not mentioned.

And T.V. Learson, then corporate senior vice-president, expressed his dissatisfaction with the use of such figures in reports on IBM's position in various user industries.

Ten people and a budget of $500,000 were allocated to DPD to conduct Yardstick. Zemen presented Yardstick along with the plan to make sales share rather than net position share *the* market measurement to the Management Review Committee in October 1968, the documents show.

New competitive figures were to be available by August 1969. By 1970, all share figures for 1968 and 1969 conformed to this market measurement approach, Sisson's memo suggested.

Burroughs Developing 'Super' Processor

DETROIT – Burroughs has announced it is developing a "super" computer designed to handle the largest problem-solving requirements of science, industry and government.

"The system utilizes an array processor architecture which will enable it to complete vector-oriented problems at speeds in excess of any system currently installed or believed to be under development," Burroughs Chairman Ray W. Macdonald said.

"The system is ideally suited for large-volume vector- or parallel-oriented problems which are often found in such applications as structural analysis, nuclear research, natural resource exploration, meteorology and econometric modeling."

The computer uses a large-scale integrated circuit implementation of Burroughs Current Mode Logic. It will use the large-scale Burroughs B7700 as its systems manager, and the total systems environment will be controlled by Burroughs Master Control Program (MCP).

The scientific processor will be programmed exclusively in Fortran under full MCP control, using a vectorizing compiler which converts frequently used serial Fortran instructions into vector operations, Burroughs said, adding this software approach is believed to be unique for this class of computer system.

The scientific processor is being developed at Burroughs' Great Valley Laboratories near Philadelphia. Delivery of the system is planned for the fourth quarter of 1978.

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CIRCULATION DEPARTMENT

'Lay Everything on the Table'

Openness Urged on Executives Negotiating Mergers

TORONTO – Executives participating in mergers and acquisitions should be completely honest with each other and lay everything on the table at the outset, according to Gilbert Mintz, president of Broadview Associates, Inc.

Mintz spoke at a recent Association of Data Processing Service Organizations meeting here where attendees were interested in the specific procedures and dos and don'ts of acquisitions rather than in the implications to their industry of future consolidation.

Bernard Goldstein, vice-president for corporate development at Tymshare, predicted by the late 1980s there will be 10 to 12 firms in the services arena each with annual revenues of $250 million.

These will have 50% of the total industry revenues, he told a session on "The Impact of Consolidation on the Industry."

That picture is not meant to be discouraging, Goldstein said, noting the smaller entities will operate on a local basis.

His vision shows the computer services industry does not accommodate itself to a monopoly, he observed.

The prime impetus toward the emergence of these large firms will be the economies of scale in hardware, communications and marketing, he said, adding the trend toward growth and toward being a multiservice vendor increases a firm's need for capital.

Along with the drive to growth comes the incentive for diversification as a move to prevent susceptibility to a "negative external event" such as federal legislation and IBM actions, Goldstein said.

"IBM by mistake can adversely affect any single market, to say nothing of what it can do through an aggressive act," he added.

Mintz explained the deficiencies in the public market are providing incentive for companies to acquire their growth through mergers since they cannot easily get sufficient capital from the investment route.

In urging complete communication between the buyer and the seller, Goldstein said both parties are going through a schizophrenic phase and no one listens to anyone else during negotiations.

However, when the dust settles, there can be some rude awakenings if items were not outlined clearly in advance. Chief executives should disclose at the outset whether they want to cash in or to stay, he said. "You must be honest; it's an ongoing relationship," Mintz remarked.

"Merger" is largely a euphemism for "acquisition," he said. In nearly all cases, one is the acquirer and the other the acquiree, he added.

However, he doesn't like to use the term "acquire" because it "makes someone feel like a lambchop."

Difficult Lesson

A lesson learned the hard way by Jack Roseman of On-Line Systems, Inc. is not to peg the sales price of a firm on future stock prices.

One must take a very close look when acquiring a software company because the assets "drive out every night," one attendee said.

John D. Morand, director of corporate development at Comtech, suggested looking at the individuals running the firms, the systems analysts and programmers and their relationship with the head man when deciding whether to acquire a firm.

One key factor is the documentation of a system. If it is not up to a point where someone else can maintain and modify the system, "then you're probably talking $60,000 to $70,000 per system to get it up to that point," he said.

Looking to the future, when he sees new CPUs with operating systems in the firmware, Morand said one should consider whether the firm is in the applications or systems area.

Also, what are the core requirements of the products? Can they be adapted to other systems – and specifically to minis? What are maintenance revenues? he asked.

Bruce Coleman of Boole & Babbage suggested the longevity of people could be lengthened if they were provided opportunities for working in new technological areas with new resources.

Jack Roseman of On-Line Systems suggested a software company might think its acquirer attractive if it offered computer facilities because many rent development time on outside machines.

However, another attendee warned of programmers' insatiable need for machine time. Service companies pondering whether to offer spare time should decide to do so only if they have a lot of spare time during the day they are willing to devote to in-house development work, he remarked.

Ansi I/O Standards Approaching Reality

(Continued from Page 52)

on whether the proposed standards should be submitted to them in a letter ballot and also be made available for public review, he said.

During the four months the standard will be out for review and X3 will collect comments and refer them to X3T9, Bob Brown, vice-chairman of X3, explained.

When the final ballot is sent out, X3 will include these comments and the technical committee's replies, he said.

If adopted and adhered to, peripherals attachable to IBM mainframers would also be compatible with other mainframers' CPUs, Jack Biddle, executive director of the Computer and Communications Industry Association, observed.

Adherence to Ansi standards is voluntary on the part of the manufacturers. Much opposition from mainframers is expected during the review by X3, he said.

X3 includes about 46 members; 16 mainframers and other manufacturers; 16 user organizations and 14 general-interest societies, Brown said.

Cassettes to Hold Edge in Magnetic Recording Mart

(Continued from Page 52)

"We believe there is an opportunity for a large, stable company to enter the cassette market, possibly by acquisition, and dominate it. Certainly, this is a more promising area than floppy disk drives, already overcrowded with large companies," the report said.

Presently, the study observed, the market for cassette drives is about 55% captive, but will decrease to slightly under 50% by 1980.

Most of the largest users make their own drives, and ICP is the only independent cassette drive manufacturer in the U.S. that sells drives in quantities comparable to the internal production of the large users, VDC said.

Figures for 1975 will show a total of 172,000 cassette drives, 10,500 cartridge drives and 52,000 floppy disk drives shipped, according to the report.

By 1980, cassette drive shipments will grow to 366,000, cartridge drives to 52,500 and floppy disk drives to 276,000, VDC estimated.

Slower Pace

VDC found the cassette drive market is no longer in rapid flux. "Users of drives are generally satisfied and are not looking for the better mousetrap. Once designed in, the mechanical and electrical complexity of the interface tends to prevent the user from changing to another drive in future product revisions," the study reported.

There is, however, a booming cassette media market. Growth was projected at an average annual rate of 28% per year through 1980.

Although the growth rate will slow to 18% per year in 1980, the volume of sales will be $54 million, up from a 1975 volume of $16.7 million, the report said.

The market for data terminals constitutes the largest segment of cassette use, closely followed by small business systems. Together they account for 60% of the market.

3M Cartridges

The 3M cartridge was originally aimed at minicomputer-based equipment because it has a better access time than the cassette, but the floppy has a data retrieval rate at least an order of magnitude faster than the 3M cartridge.

Standards for information interchange have been prepared by the American National Standards Institute (Ansi) for cassettes and 3M cartridges.

"The physical standards for the cassettes and cartridges have been accepted readily. The formatting specifications of the original cassette standard have been widely disregarded," VDC stated.

"A second standard using two-channel speed-independent code is in the process of approval, but it will be similarly ignored," the report predicted. "There is no single large user such as IBM to impose de facto standards by requiring industry to interface to its products."

Floppy disk standards are now being worked on by Ansi and will specify IBM compatibility, the report forecast.

The 3M cartridge (phase-encoded, 1,600 bit/in.) standard was accepted by the industry without dissent, but it is not always adhered to because its lower recording density can reduce costs and improve reliability, the report stated.

Sales of 3M cartridge drives will show figures of $5 million in 1975, or 1/13th the size of the cassette market, the study said. The market will grow to $8.5 million in 1980 from a small base.

The 3M Co. manufactures most of the cartridges and provides license agreements to at least one other supplier, Information Terminal Corp.

In spite of competitive technologies, cassette drive usage is increasing in absolute numbers, but floppies are gaining a larger share of the market for data recording in general-purpose minicomputer applications, intelligent terminals and small business systems wherever fast access is important, the report said.

DP Balance of Trade Continues Favorable

WASHINGTON, D.C. – Computers and related equipment accounted for 85% of total business machine exports during the first half of 1976, according to the U.S. Department of Commerce.

U.S. business machines in general showed a favorable balance of trade amounting to $870.6 million, a 1% increase over the first half of 1975, Commerce said.

Imports of computers and related equipment rose 31% to $83 million, while exports rose to $1.2 billion, up 11% from the year-ago period.

Canada once again was the biggest customer for U.S. computers, purchasing exports valued at $182.2 million, according to Commerce figures.

The Federal Republic of Germany followed with $149.3 million; the UK with $136.1 million; France with $133 million; and Japan with $108.5 million.

Key Tronic Files Suit

SPOKANE, Wash. – Key Tronic Corp. has filed a lawsuit in the U.S. Federal Court in Seattle, against Controls Technology Corp., doing business as Controls Development Corp. and Automix Keyboards, Inc.

The lawsuit seeks to secure a judgment that Controls Development has no claim against Key Tronic for alleged patent infringement and that the patent issued to Controls Development for a push-button capacitive switch is invalid and unenforceable.

The suit also seeks an injunction against Controls Development from threatening Key Tronic or its customers with infringement or lawsuits in using Key Tronic's capacitor switch in its keyboards.

Security Analysts Told

Honeywell Bull-CII Merger Advantageous

NEW YORK – The French computer merger of Honeywell Bull with Compagnie Internationale pour l'Informatique (CII) will significantly reduce the debt level of Honeywell, Inc. and substantially improve its debt-to-capitalization ratio, security analysts were told here recently.

The transaction was completed June 30, 1976 and was reflected in Honeywell's third-quarter earnings report issued Oct. 13.

At the time of the merger, Honeywell's interest in Honeywell Bull changed from 66% to 47%, according to James H. Grenell, vice-president and corporate controller.

Consequently, Honeywell's share in the earnings of the merged company, starting in the third quarter of 1976, were reported on an equity basis instead of on the consolidated basis previously used for Honeywell Bull.

Prior periods have been restated in order to present consistent comparative operating statements, he added.

Grenell pointed out that restating the financial performance of Honeywell Bull on an equity basis resulted in no change in prior years' earnings or earnings per share, although the sales revenues, costs and expenses of the French company will no longer be included with those of Honeywell.

Louis E. Navin, vice-president and corporate treasurer, said the most significant effects of the restatement were to reduce Honeywell's total 1975 debt by more than 38% and reduce the debt-to-capitalization ratio in 1975 from 37% to 28% – with no change in stockholders' equity, according to Navin.

Clarence W. Spangle, president of Honeywell Information Systems, cited the following additional benefits of the merger: a substantially larger share of the French computer market; plans of the French government to purchase approximately $800 million worth of computer equipment from CII-Honeywell Bull in the next four years, plus subsidies from the French government of approximately $240 million to be applied to research and development and transition costs of the merger in the next four years; increased R&D capability; strong involvement by Compagnie Generale d'Electricite, a shareholder in the merged French company; a cash payment to Honeywell of $58 million that was above book value and yielded a $12 million net capital gain.

Setting the stage for a discussion of some of Honeywell's future plans, Spangle reviewed a series of events beginning six years ago when Honeywell merged its general purpose computer business with that of General Electric (GE).

In the ensuing years, Honeywell has concluded an arrangement with Xerox to manage its worldwide computer base, formed a joint venture with Control Data Corp. to develop and manufacture peripheral devices and concluded the French merger forming CII-Honeywell Bull, according to Spangle.

"We have expanded our installed base and our revenue stream threefold since the GE merger. We have a product capability in place to protect this investment," he said.

"We have achieved a level of line unification that serves our users' needs and we have accomplished acquisitions, consolidations and economies that have improved our cash position. We have a solid financial foundation," he noted.

One of Honeywell's major goals is to establish itself as an industry leader in the high-growth field of computer networking and distributed processing, Spangle told the analysts.

"In the near future," he added, "we intend to launch our Series 60 computer family on an aggressive path that will continue to support our installed base but also will make Honeywell the logical choice for any computer user interested in implementing advanced networking and distributed processing applications.

"We will capitalize on our current Series 60 strength and reveal new functionality to help our users expand. We think we have developed a unique approach, integrating our minicomputer line and our general purpose computer systems."

Financial News

National Semi Net Falls in Quarter

SANTA CLARA, Calif. – National Semiconductor Corp.'s earnings fell in the first quarter despite increased revenues.

Earnings for the first quarter ended Sept. 19 were $3.3 million or 25 cents a share compared with $5.2 million or 40 cents a share a year ago.

Revenues for the quarter rose 36% to $112.1 million from $82.4 million in the year-ago quarter.

The first-quarter sales gain was due to a heavy increase in semiconductor demand which began at the end of last year, according to Charles E. Sporck, president.

He added that while the decline in profits was disappointing, it was not unexpected because of previously disclosed problems in digital watch die and module assembly, which have since been solved.

"Steady progress is being made and sales will be less affected by the watch die problem during the second quarter than in the first," Sporck noted.

"We still expect that net earnings for National's entire fiscal year will be above the $1.44 per share level reported for fiscal 1976 because of correction of the watch situation and the fact that all other facets of the company – semiconductor and supermarket point-of-sale – are performing well," he said.

Incoterm Net Down in Six Months

WELLESLEY HILLS, Mass. – Incoterm Corp.'s earnings dropped both for the second quarter and for the six month period due largely to a higher federal income tax rate.

Earnings for the second quarter were $556,079 or 28 cents a share compared with $585,009 or 29 cents a share in the year-ago period.

Revenues rose to $8.9 million from $8 million a year ago.

For the six months, earnings dropped to $912,294 or 46 cents a share compared with $1.3 million or 65 cents a share including a $193,000 tax credit.

Revenues were $17.1 million, up from $15.6 million a year ago.

Backlog at the end of the second quarter was $27.5 million, up 67% over the second quarter a year ago and 32% over fiscal 1977's first quarter.

During the second quarter, the company completed negotiations for the external financing of a short-term rental program to be offered to customers in the U.S. and the UK.

Nickels & Dimes

Measurex has exercised its option to extend the maturity on a total of $5 million of subordinated promissory notes held by the Massachusetts Mutual Life Insurance Co. and MassMutual Corporate Investors, Inc.

$ $ $

National CSS has declared a 5-cent quarterly dividend payable Dec. 1 to holders of record Nov. 15.

$ $ $

Centronics declared a quarterly dividend of 20 cents payable Jan. 3 to holders of record Nov. 30.

$ $ $

Nashua has declared a 17-cent quarterly dividend payable Dec. 3 to holders of record Nov. 19.

$ $ $

Lynch Communications has declared a 7-cent quarterly dividend payable Nov. 15 to holders of record Nov. 2.

And Hurting Employment

Decline in R&D Seen Stunting U.S. Economic Role

CHICAGO – If the decline in research and development (R&D) investment by the U.S. is not reversed, it could seriously affect the nation's economic leadership and our ability to provide the 18 million new jobs that must be generated in the next 10 years, according to Dr. Thomas A. Vanderslice, vice-president and group executive of General Electric's Special Systems and Products Group.

In addition to the nation's ability to compete in the world marketplace, the pace at which it can develop new advances in energy sources, materials and many other fields which are vital to American economic growth and its people are also at stake, he said here recently.

In spite of the strong position we currently enjoy, "there are many – economists, scientists, representatives of government, industry and the academic community – who believe the facts show that technological innovation in this country is approaching a critical point," Vanderslice stated.

He cited several trends indicating an erosion of U.S. technological leadership.

The 25 years following World War II saw some of the most dramatic commercial innovations in history – stemming at least in part from the R&D of the '40s: computers; the transistor and integrated circuits; radar; communication, weather and navigational satellites, he noted.

For most of this period, the U.S. had a comparative advantage in new and improved products and processes, an advantage that has continued to the present in agricultural and so-called high-technology products, he asserted.

"For example, one study showed that of some 500 major technological innovations introduced into the commercial market between 1953 and 1973 by the major industrial countries, the U.S. led by a wide margin, Vanderslice noted.

"However, the U.S. lead declined from the late 50's to mid-60's, falling from 82% to 55% of innovations. The slight upward bleep at the end of the line does not represent a gain for us, but further decline for the UK, vis-a-vis the rest of the industrial world.

"The largest actual gains, as might be expected, were recorded by Japan and West Germany," he said.

Patents show the same kind of trend, with U.S. patents granted to foreign inventors more than doubling from the '60s to the 70's. The favorable balance with Japan had declined steadily since 1962, as its patenting of inventions in the U.S. increased some three-fold, he added.

"With the rich heritage of technical competence resident in our labor and managerial forces, it may seem strange to say that U.S. technology is in trouble today.

"Yet, I believe, there are trends that, unless corrected, could lead to a rapidly maturing crisis, such as the UK is now undergoing in translating her technology into economic growth. This is a road we dare not go down," he stated.

Budget Allocations

R&D has been well nourished in the U.S. But in recent years, R&D has been suffering from malnutrition – and it may be suffering not just from a lack of federal and corporate calories, but also from an imbalanced diet.

In the U.S., the percent of gross national product (GNP) devoted to R&D has dropped steadily for more than nine years. Meanwhile, other countries have registered substantial gains.

Underlying the gains of Japan and West Germany were continuous large increases in funding from both industry and government, according to Vanderslice.

R&D is a comparatively small part of the total federal budget. It is also apparent that while total federal outlays approximately doubled between 1965 and 1975, approaching $400 billion, R&D remained relatively constant.

The share of the federal budget represented by R&D and by R&D plant programs has declined continuously from 1965, not even keeping pace with inflation, he said.

Corporate spending for R&D, on the other hand, has just about managed to keep pace with inflation, remaining nearly constant for most of the period at around 1% of the GNP while federal R&D spending has dropped from almost 2% of the GNP in 1966 to an estimated 1.2% in 1976.

The record suggests American industry more fully recognized the value of maintaining constant, continuing levels of support for R&D, than has the Federal government, Vanderslice noted.

"In the long run, I can think of nothing that can give more leverage on all of the problems that confront us now and in the future than to protect the 'seed corn' of scientific and technological competence that resides in our universities, industry, government in-house and privately funded organizations," Vanderslice said, emphasizing the amounts of money involved would be modest compared to other items in the federal budget.

In products with low technical content, the U.S. trade balance dropped from a breakeven point in 1960 to a $16 billion deficit, he said. At the same time, high-technology product exports were up to a plus of over $25 billion per year.

"High-technology companies appear to have a growth rate about double that of low technology companies and create jobs five times as fast," he said.

Renewed emphasis on U.S. technology, he said, "would create 'new' jobs for the scientists and engineers, who in the larger sense create not only their own jobs but jobs for hundreds and thousands of others."

Number of Scientists Decline

Vanderslice pointed out that the number of scientists and engineers engaged in R&D per 10,000 population had declined from the late 60's to the present. The U.S. is the only major industrial nation in which this indicator declined over this period.

"The free and exuberant atmosphere of technical innovation that sustained research and engineering in the 50's and 60's has disappeared as we seem to be heading toward a nation in which the number of people able to articulate the problems will be greater than the number of people capable of solving them," he asserted.

He warned that "much of what we expect science and technology to provide in the future, requiring new understandings and inventions will, in the opinion of many in the scientific community, be slower in coming unless present trends are reversed."

Earnings Reports

ADDRESSOGRAPH-MULTIGRAPH
Year Ended July 31

	1976	a1975
Shr Ernd	$.80	$.78
Revenue	572,920,000	584,246,000
Earnings	6,431,000	6,257,000
3 Mo Shr	.35	.44
Revenue	157,626,000	155,051,000
Earnings	2,781,000	3,497,000

a-Restated for foreign currency translation.

ADVANCED SYSTEMS
Year Ended Mar. 31

	1976	1975
Shr Ernd	.....	$.42
Revenue	$8,962,352	8,346,282
Earnings	a(16,333)	431,194

a-Reflects $473,191 in pretax write-offs.

AMDAHL
Three Months Ended Sept. 24

	1976	a1975
Shr Ernd	$.99	.....
Revenue	26,045,000	.....
Tax Cred	3,302,000	.....
Earnings	6,898,000	.....
9 Mo Shr	1.69	.....
Revenue	52,336,000	.....
Tax Cred	4,775,000	.....
Earnings	9,972,000	.....

a-Operations began in fourth quarter of 1975.

AMERICAN MICROSYSTEMS
Three Months Ended Oct. 2

	1976	1975
Shr Ernd	.....	$.02
Revenue	$17,571,000	17,285,000
Earnings	(1,929,000)	46,000
9 Mo Shr	.....	.21
Revenue	49,606,000	48,644,000
Earnings	(11,078,000)	461,000

APPLIED DIGITAL DATA SYSTEMS
Three Months Ended Aug. 31

	1976	1975
Shr Ernd	$.33	$.23
Revenue	6,146,013	4,676,408
Earnings	1,249,072	861,174
9 Mo Shr	.86	.57
Revenue	16,558,415	11,825,967
Earnings	3,273,172	2,136,278

AUTOMATIC DATA PROCESSING
Three Months Ended Sept. 30

	1976	1975
Shr Ernd	$.33 a$.26	
Revenue	53,020,000	41,283,000
Earnings	4,608,000	3,589,000

a-Adjusted for June 1976 two-for-one stock split.

BOLT, BERANEK & NEWMAN
Three Months Ended Sept. 30

	1976	1975
Shr Ernd	$.05	.....
Revenue	8,914,500	$7,460,200
Earnings	68,000	(112,100)

BOOTHE COMPUTER
Three Months Ended Sept. 30

	1976	1975
Shr Ernd	$.31	$.05
Revenue	15,095,000	10,494,000
Disc Op	.....	(275,000)
Earnings	1,102,000	205,000
9 Mo Shr	.77	1.08
Revenue	41,707,000	30,197,000
Disc Op	.....	(220,000)
Spec Cred	.....	a3,775,000
Earnings	2,852,000	4,206,000

a-Gain from extinguishment of debt.

BUNKER RAMO
Three Months Ended Sept. 30

	1976	1975
Shr Ernd	$.34	.....
Revenue	77,203,000	$70,284,000
Tax Cred	330,000	.....
Earnings	2,615,000	(2,362,000)
9 Mo Shr	.65	.....
Revenue	241,767,000	218,473,000
Tax Cred	1,680,000	.....
Earnings	5,709,000	(1,897,000)

BURROUGHS
Three Months Ended Sept. 30

	1976 (000)	a1975 (000)
Shr Ernd	$.92	$.83
Revenue	443,235	367,712
Earnings	37,188	32,779
9 Mo Shr	2.58	2.41
Revenue	1,312,808	1,149,815
Earnings	103,928	95,287

a-Restated.

CALIFORNIA COMPUTER
Three Months Ended Oct. 3

	1976	1975
Shr Ernd	$.08	.....
Revenue	30,513,000	$26,655,000
Earnings	267,000	(3,224,000)

CENTRONICS DATA COMPUTER
Three Months Ended Sept. 30

	1976	1975
Shr Ernd	$.57	$.45
Revenue	12,835,511	11,202,565
Earnings	2,781,030	2,142,802

COMPUSCAN
Three Months Ended Aug. 31

	1976	1975
Shr Ernd	$.11	$.21
Revenue	3,102,000	2,796,000
Tax Cred	.....	149,000
Earnings	259,000	341,000

POSITION ANNOUNCEMENTS

STANLEY *Help Us Do Things Right*

MANAGER
DATA CENTER OPERATIONS

The Stanley Works is seeking aprofessional data processing manager to take charge of the Corporate Data Center Operations function which includes Computer Operations, EDP Controls, User Services and EDP Documentation. Successful applicant will have a college degree and is currently managing a data processing function which consists of large-scale IBM computers, on-line systems, teleprocessing, in an OS environment. Excellent opportunity for growth. Knowledge of hardware and software is required.

Please send resume with salary history to:

THE STANLEY WORKS
Corporate Employment, Dept. 1115C
P.O. Box 1800, New Britain, Conn. 06053
Stanley Tools, Stanley Hardware, Stanley Steel.

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MINI-COMPUTER SOFTWARE PROGRAMMER

The Chicago Board Options Exchange, the central marketplace for trading stock options, is seeking a Mini-Computer Software Programmer to design and implement software for a communications concentrator. Will interface with IBM 158 MP system connected to existing 25 CPU mini-computer base network.

Requires 2-5 years recent mini-computer assembler language coding. Hands on experience with DEC, Data General, Varian or System 7 helpful.

Our compensation package includes highly competitive salary, tuition reimbursement and company paid medical, dental and life insurance. Please send letter, resume or call (312) 431-6931.

Personnel Department

The ChicagoBoard Options Exchange
141 W. Jackson Street
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MARKETING EXECUTIVE
Data Processing

Our need is a Marketing Executive that can meet the challenge of a privately held company growing Revenues and Profits at a 50% per annum rate. 1076 Revenues were 10 Million Dollars worldwide.

The individual we seek will have a minimum of 10 years sales and line marketing management experience in the Data Processing industry. Experience with one of the major computer manufacturers is required.

The responsibilities will include the direction and motivation of 4 managers and 25 marketing representatives located in 8 Midwestern cities.

The compensation package offered will include salary, profit sharing, benefits and equity participation. Earned compensation at 100% of quota will be $50,000.

Our sales organization markets products and services at the executive level of Fortune 500 corporations.

If you are interested in a unique opportunity, please reply in confidence to:

CW Box 4823
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Newton, Mass. 02160

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position announcements

SENIOR PROGRAMMER

Tired of city living? Medium-size utility in western mountain recreation area looking for a senior programmer.

370/135 DOS/VS installation. Requires current significant experience with COBOL and CICS. Teleprocessing applications under development.

For immediate attention, please send resume and salary requirements in complete confidence to employment supervisor, Sierra Pacific Power Company, P.O. Box 10100, Reno, Nevada 89510.

An Equal Opportunity Employer

position announcements

PROGRAMMER/ ANALYST

Would you like variety and responsibility on a college campus? Programmer/Analyst-Educational Systems develops systems and application software. Full-time position, available immediately; requires bachelor's degree in related discipline, one high level and one assembler language, and related experience, including one year as programmer or programmer/analyst. Submit resume, current and/or expected salary, and date available to:

Mr. R. Whitcomb
Personnel Director
Lawrence University
P.O. Box 599
Appleton, WI 54911

An Equal Opportunity Employer

Systems Engineer

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Datapoint offers career development, rapid advancement and a long term association with a company that added new dimensions to the business world of computing, along with challenges and rewards of an exciting career with a company that recognizes and appreciates ability.

Call collect to **Alfred DeiMaggi, (617) 890-0440** for an interview appointment or send resume with salary history to **Datapoint Corporation, 460 Totten Pond Road, Waltham, MA 02154.**

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NCR
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New Positions in San Diego

The Special Systems Division of NCR located in San Diego, is involved in the development of on-line banking and retail systems. Current and future business commitments require that we add several systems analysts in the following categories:

Communications Software Development

These positions entail the system design and development of software for large communications networks. Experience at all levels in assembly language and a mini-computer background is necessary. Experience in telecommunications, software and a related BS degree is preferred.

Software Support

Requires persons skilled in assembly language, with a sound background in mini-computers to perform maintenance and field support of telecommunications networks. A number of these positions provide the opportunity for substantial travel and customer contact.

Computer Systems Simulation

A position exists for a person with a minimum of two years' experience to perform simulation of computer systems and compiler performance measurement. This position requires knowledge of statistics and queuing theory and programming experience in languagues such as Fortran, GPSS or Simscript. A related degree is preferred.

Please submit resume including salary history to Bruce Bertsch, Manager, Industrial Relations.

NCR

Special Systems Division
4045 Sorrento Valley Blvd.
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Experience in software support; compilers, assemblers, operating systems, debugging tools. State-of-the-art environment providing in-house time sharing support for micro-processor software development. MS or BS in Computer Science or related field required. Candidate must be capable of system definition, implementation and interface with other programmers. Excellent growth opportunity.

Send resume in full confidence to: Bill Allen.

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Qualified applicants should possess specific experience developing and maintaining MVT and/or OS/VS1 systems. Knowledge of data communications, IMS and interactive systems desirable.

You will assist in developing, installing, and maintaining all software, including: operating systems, IMS data base, interactive systems and program products for a corporate computer center with multiple 370's serving multiple divisions.

Send resume and salary requirements in confidence to:

Z-67, P.O. Box 2068
Philadelphia, PA 19103
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San Francisco Peninsula

Our Software Engineering Department is continuing to grow. Professionals who join us will help expand the state-of-the-art in such areas as MULTI-PROCESSING, MULTI-COMPUTER NETTING, DATA MANAGEMENT, SIGNAL PROCESSING, OPERATING SYSTEMS and REAL-TIME SOFTWARE SYSTEMS.

Currently we have several openings in the following areas:

DATA BASE MANAGEMENT SYSTEMS

Extensive storage and retrieval from large multi-user technical data base. Requires 1-5 years' experience in detailed design and implementation.

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Requires 3-10 years' experience in test plan development, execution and acceptance testing to systems specs.

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Senior level with Univac, UYK-7 experience.

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Diagnostic support software and general software development. Requires 2-10 years' experience.

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5-10 years' experience performing software systems engineering or task management of 10-30 man real-time intelligence system software development projects.

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Sr. Sys Anal IMS Data Base	$19K
Sys Prog, ALC, IMS	$19K
Sys Prog Anal., Assemb, OS HASP	$19K

All fees and expenses paid by employers. Send resume in confidence stating salary and relocation.

ENGINEERING/EDP SEARCH, INC. (Agency) 84 N.E. Loop 410, Suite 124E, San Antonio, TX 78216

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PDP 11 TO $22,000

Our client, a rapidly expanding medium size technological products company, seeks an individual with at least two years experience related to PDP 11 hardware. Must be able to program in Macro & Fortran IV, knowledge of RT 11 & RSX 11 M operating systems. Position is located in excellent suburban location adjacent to highly desirable Mid-Atlantic metropolitan area. Our client offers outstanding professional growth and challenge. All employment costs and relocation expenses paid by client company. Contact in confidence, S.J. Burns (215) 561-6300).

FOX-MORRIS
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1500 Chestnut St.
Philadelphia, PA 19102

FACULTY POSITIONS IN COMPUTER SCIENCE

Applications are invited for faculty positions in the Department of Computer Science starting in January and/or September of 1977. Candidates should have a Ph.D. in computer science or a closely related discipline together with strengths in software engineering, applications and minicomputers. Industrial experience and a strong interest in computer systems is desirable.

The department has a PDP 11-40 based graphics system and a PDP 11-20 system. A DEC-10 and a DEC-20 system are available for general university-wide use. Please send resume to: R.P. Banaugh, Department of Computer Science, University of Montana, Missoula, Montana 59801. (406) 243-2883. An equal opportunity and affirmative action employer.

Systems Application Manager A

$1,390-$1,780/Month

Position involves management of analyst/programmers and production personnel in administrative applications. Minimum Qualifications: A.A. degree in Data Processing, or a BA; and 2 years of programming and 2 years of systems analysis work; and 1 year as a Systems Analyst or Programmer Lead, or equivalent. 2 or more years of additional programming or systems analyst work may substitute for required education. An MA may be substituted for 1 year required work experience (lead excluded). Previous management experience, knowledge of large scale 360/370 technology or equivalent, technical competence, communication skills, and the ability to interact with people are highly desirable. Apply before December 7, Office of Staff Personnel, 134 French Administration Building, Pullman, Washington 99164. (509) 335-4521. Washington State University is an Equal Opportunity Employer.

SYSTEMS ANALYST

OUR CONTINUED EXPANSION has created a responsible position for a qualified individual. We are seeking an individual with at least 5 years Data Processing experience with a minimum of 2 years devoted to design and implementation of Retail Operations and Distribution Systems.

Candidate must have a good working knowledge of Cobol, Teleprocessing, and Data Base Management. Degree required.

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Data Processing Careers, Inc.
Suite 1109
Stemmons Tower West
Dallas, Texas 75207
DETROIT
Electronic Systems Personnel
1705 Fisher Building
Detroit, Michigan 48202
FLORIDA
Data Sciences Personnel, Inc.
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15490 N. W. 7th Avenue
Miami, Florida 33168
HARTFORD
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Hertford, Connecticut 06105
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NORTH CAROLINA
TaskForce, Inc.
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P.O. Box 5888
Greensboro, North Carolina 27405
PITTSBURGH
Electronic Systems Personnel
106 Lawyers Building
428 Forbes Avenue
Pittsburgh, Pennsylvania 15219
PROVIDENCE
Xavier Associates, Inc.
10 Dorrance Street
Providence, Rhode Island 02903
SAN FRANCISCO
The Computer Resources Group Agency, Inc.
303 Sacramento Street
San Francisco, California 94111
SYRACUSE
CFA Associates Personnel, Inc. (Agency)
2530 James Street
Syracuse, New York 13206
TULSA
Data Processing Careers, Inc.
Suite 10, Park 21 Building
2626 East 21st Street
Tulsa, Oklahoma 74114
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ESP Systems Corporation
Suite 210
1211 Connecticut Avenue N.W.
Washington, D.C. 20036

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Several positions for S & P people with prior BC/BS background will be opening throughout the U.S. in the next 90 days with my client firm.

Immediate Need: Marketing Team Support Analyst with 3-5 yrs. BC/BS exp. or Sr. Analyst on Claims Processing Team or 3 yrs. subscribers' contract exp. from administrative side. Locate major Southwestern City. Start $20-21,000 all fees paid. Send resume with salary history to Ken Thompson.

DUNHILL OF BOULDER
1790 30th St.
Boulder, Colo. 80301

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Ball State University has an immediate opening for a Supervisor of Research Programming to direct the research programming of the university. 2-3 years experience with program support for DEC System-10 and IBM 360 preferred. Experience with packaged statistical programs required. Supervise a small staff in an atmosphere that is busy, informal and dedicated to client services. Twenty-four days paid vacation, educational opportunities, excellent fringe benefits. Application deadline Nov. 30. Send resume to:

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Minimum qualifications include experience with FORTRAN and one other higher level language, job control language, utilities and an assembler language.

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Salary: $10,500 to $13,000

Starting Date: Position Available Immediately

Send Resumes by December 1, 1976 to:

Ms. Suzanne Greenberg
Head Consultant
Computing Services Office
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University of Illinois
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A national consulting firm located in suburban Chicago and specializing in finance/personnel related matters is in the process of converting their present Burroughs 4700 system to the 6700.

We are seeking an individual who has:

- Significant experience in Burroughs 6700 system software.
- Detailed knowledge of the 6700 operating system, utility programs and programming languages (APL, ALGOL, FORTRAN, with an emphasis on COBOL).
- A working knowledge of the Burroughs 4700.
- Some conversion experience is highly desirable.

Compensation is highly competitive. This is an excellent opportunity for an individual with the requisite interpersonal skills and intellectual capabilities to join our consulting staff upon completion of the conversion.

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Systems design and analysis of customer information systems in the utilities industry. Excellent verbal and written communication skills. Current in Cobol and ALC for IBM 360/370 OS system.

PROGRAMMER/ANALYST

High proficiency in programming with Ansi Cobol and ALC for 360/370 OS system. Experience with VSAM, IMS, and DL/1 are desirable.

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Programmers

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Within the past 18 months, this exceptional company has delivered 21 of these systems. Over $88,000,000 worth. But more to the point: 8 of the 21 were shipped during the third quarter. Which is why we need help...from exceptional, enthusiastic individuals who need to perform well because the task is worth it, and because its fun. We made a commitment to that philosophy when we began, and we're sticking to it. We have intentionally created a friendly environment where efforts are recognized. We are keeping it that way, despite our growth.

Below are some of our more immediate needs. Karen Daly would like to hear from you at Amdahl Corporation, 1250 East Arques Avenue, Sunnyvale, California 94086. To expedite your application, please indicate on your resume the specific postion you are responding to in this ad. We are, of course, an equal opportunity employer.

SYSTEM PROGRAMMER OPPORTUNITIES AT AMDAHL (MVT/SVS/MVS/VM)

Here are opportunities worthy of your immediate consideration. Opportunities to work shoulder-to-shoulder with some of the industry's top software talent in a company committed to forefront software support as well as forefront technology. Prove it to yourself by talking with current Amdahl users and our own software group. Then make a move and remove yourself from the mundane. All of the following openings are within our expanding software staff at our new headquarters on the San Francisco Peninsula...one of the nicest places to work, live and play in the country.

SOFTWARE TECHNICAL SUPPORT

You will work closely with Amdahl field personnel and customers in our Field Support Center to resolve software problems encountered by Amdahl users. The job provides an opportunity to gain in-depth experience with operating systems components while actually shooting bugs. A detailed knowledge of the internals of at least one operating system and a familiarity with operating systems utilities and SMP are musts for this job.

SOFTWARE SYSTEMS MAINTENANCE

You will develop and maintain 470V/6 model-dependent support for each of the SCPs. Incoming maintenance material is reviewed and generated for redistribution to Amdahl customers. An opportunity to evalute new SCP function and be involved in program development. A detailed knowledge of operating systems internals and concepts is required, along with a working knowledge of operating systems utilities and SMP.

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You will generate, apply, and review all software and materials distributed to users. The job provides an opportunity to operate systems in a hands-on environment. Successful candidates will possess a good working knowledge of operating systems components and operation. Additionally, close working familiarity with operating systems utilities, SMP, and assembler language is a must.

FIELD SORTWARE OPPORTUNITIES AT AMDAHL

We are generating constant field openings in concert with the rate at which 470V/6 shipments are growing. We need individuals with both the attitude and aptitude to carry our enthusiasm for unparalleled software support into the field. Immediate opportunities exist in our Eastern and Mid-Western Regions.

FIELD SYSTEMS ENGINEERS

You should have a need to feel useful to Amdahl users in a mixed-vendor environment and have a propensity for exuding the Amdahl enthusiasm. You must have a firm grasp on software systems, in-depth knowledge of large system internals (OS/MVT, VM, VS2, SVS, or MVS) and excellent diagnostic ability.

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OMICRON

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Our client, a N.Y.S.E. listed corporation, is actively seeking an individual capable of taking responsibility for a major conversion effort from DOS/VS to OS/VS on an IBM 370/158. Must have management and systems programming experience in a similar environment. VTAM 3704 or NCP expertise is highly desirable.

Systems Programmers

Requires 4 years or more experience as a systems programmer in an IBM OS/VS environment. Must have good user skills and capable of working in a team effort. MVS and/or IMS expertise is highly desirable.

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PROGRAMMER/ SYSTEMS

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COMPUTER PROGRAMMER

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Forward resume outlining salary requirements to Fred Arno, Digital Equipment Corporation, Dept. W115, 162 Main Street, Maynard, Massachusetts 01754.

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Please submit your resume (indicating which position you are interested in), including salary requirements, to Department C, Datatrol, Inc., Kane Industrial Drive, Hudson, MA 01749. Telephone (617) 568-1411.

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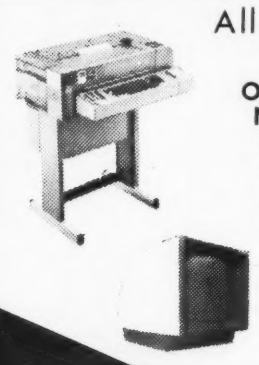

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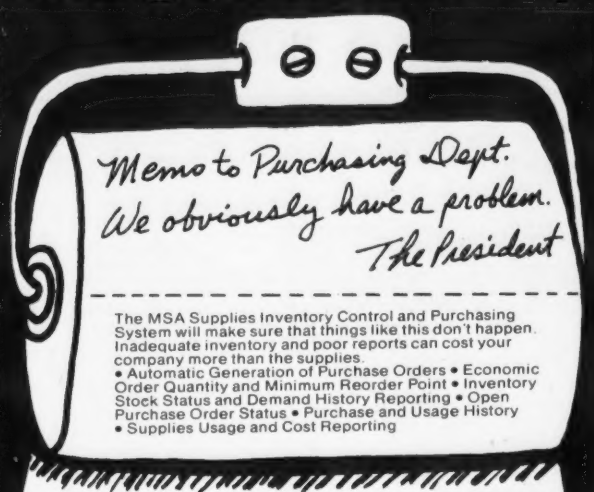

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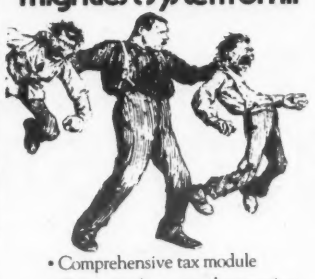

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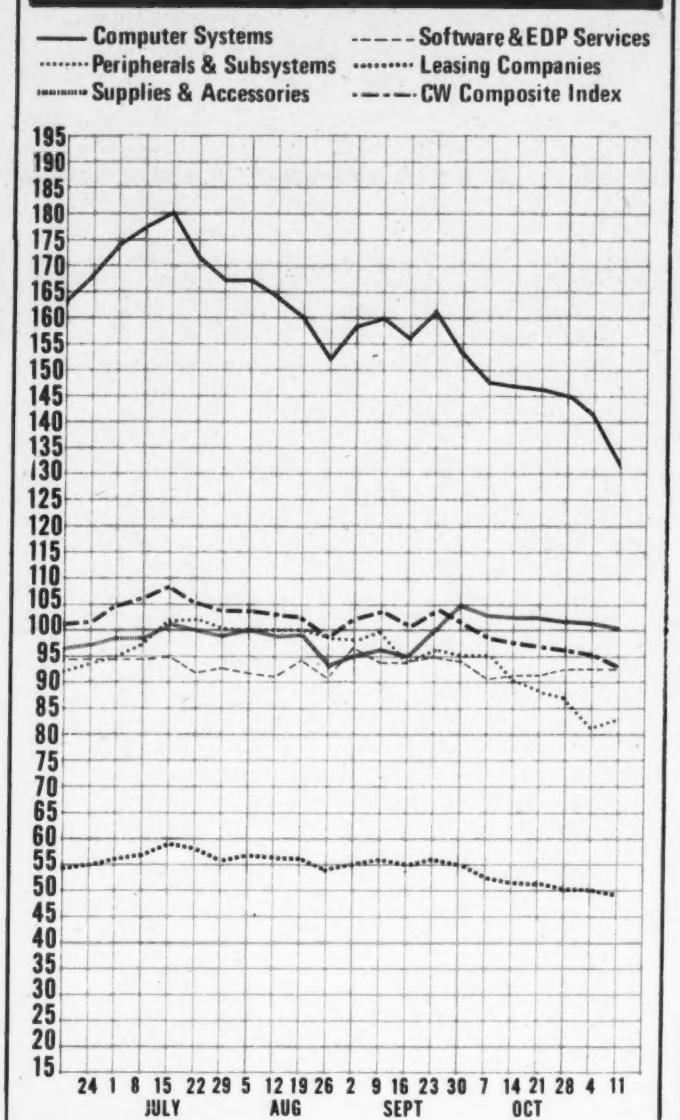

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PRIME COMPUTER
Three Months Ended Oct. 3

	1976	1975
Shr Ernd	$.29	$.10
Revenue	6,011,000	2,994,000
Tax Cred	351,000	111,000
Earnings	676,000	202,000
9 Mo Shr	.65	.20
Revenue	14,777,000	7,910,000
Tax Cred	726,000	212,000
Earnings	1,484,000	411,000

RECOGNITION EQUIPMENT
Three Months Ended July 31

	1976	1975
Shr Ernd	$.21	$.12
Revenue	15,580,000	13,465,000
Tax Cred	388,000	224,000
Earnings	1,215,000	733,000
9 Mo Shr	.71	.36
Revenue	48,841,000	42,477,000
Tax Cred	1,455,000	965,000
Earnings	4,183,000	2,082,000

SANDERS ASSOCIATES
Year Ended July 30

	1976	1975
Shr Ernd	$1.20	$3.27
Revenue	198,286,000	180,936,000
Tax Cred	1,950,000	a13,411,000
Earnings	5,715,000	14,945,000
3 Mo Shr	.45	.12
Revenue	51,099,000	51,601,000
Tax Cred	809,000	189,000
Earnings	2,148,000	546,000

a-Includes $7,889,000 from debentures exchange.

MINI-COMPUTER SYSTEMS
Three Months Ended July 31

	1976	1975
Shr Ernd	$.33	$.08
Revenue	2,357,000	1,137,000
Tax Cred	.....	3,000
Earnings	226,000	54,000
9 Mo Shr	.85	.52
Revenue	5,910,000	3,157,000
Tax Cred	.....	98,000
Earnings	563,000	325,000

WYLE LABORATORIES
Three Months Ended July 31

	1976	1975
Shr Ernd	$.31	$.11
Revenue	36,451,000	29,476,000
Earnings	1,040,000	369,000
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Revenue	71,618,000	58,468,000
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TRADE*QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, NOVEMBER 10, 1976

All statistics compiled, computed and formatted by TRADE★QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

E X C H		PRICE 1976 RANGE (1)	CLOSE NOV 10 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	AMDAHL CORP	23- 30	25 1/2	+ 1/4	+0.9
N	BURROUGHS CORP	84-108	85 1/2	-4 1/8	-4.6
O	COMPUTER AUTOMATION	10- 19	14 3/8	+ 1/4	+1.7
N	CONTROL DATA CORP	18- 27	21 5/8	-1 7/8	-7.9
N	DATA GENERAL CORP	40- 60	43 1/2	+1 1/8	+2.6
O	DATAPOINT CORP	24- 46	23 1/2	-2 1/2	-9.6
O	DIGITAL COMP CONTROL	2- 7	5 1/2	- 3/8	-6.3
N	DIGITAL EQUIPMENT	46- 60	49	- 7/8	-1.7
N	ELECTRONIC ASSOC.	2- 5	2 1/4	+ 1/8	+5.8
A	ELECTRONIC ENGINEER.	7- 16	7 5/8	+ 1/8	+1.6
N	FOXBORO	28- 50	43 1/4	+ 1/2	+1.1
O	GENERAL AUTOMATION	4- 11	4 1/8	- 1/2	-10.8
O	GRI COMPUTER CORP	1- 1	5/8	0	0.0
N	HEWLETT-PACKARD CO	80-117	81 1/2	-2	-2.3
N	HONEYWELL INC	34- 56	41 5/8	-1 1/2	-3.4
N	IBM	227-288	261	-7	-2.6
O	MANAGEMENT ASSIST	4- 12	5 1/2	- 3/4	-12.0
O	MEMOREX	18- 33	18 1/8	-1 7/8	-9.3
O	MICRODATA CORP	10- 28	14 5/8	-2 7/8	-16.4
O	MODULAR COMPUTER SYS	3- 14	2 1/2	-1 1/4	-33.3
N	NCR	24- 37	32 1/2	-1 3/8	-4.0
O	PRIME COMPUTER INC	4- 14	13 1/4	- 1/4	-1.8
N	PERKIN-ELMER	19- 27	20	-1	-4.7
N	RAYTHEON CO	45- 67	59 1/8	-1 1/2	-2.4
N	SPERRY RAND	40- 52	42 1/2	-2 7/8	-6.3
O	SYCOR INC	o- 31	9	-1	-10.0
A	SYSTEMS ENG. LABS	5- 10	5	-1 5/8	-24.5
N	VARIAN ASSOCIATES	12- 17	12 3/8	- 3/8	-2.9
A	WANG LABS.	11- 20	13 3/8	-1 1/8	-7.7

LEASING COMPANIES

E X C H		PRICE 1976 RANGE (1)	CLOSE NOV 10 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	COMDISCO INC	3- 10	9	+ 1/2	+5.8
A	COMMERCE GROUP CORP	2- 3	1 5/8	- 3/8	-18.7
A	COMPUTER INVSTRS GRP	1- 3	1 3/8	+ 1/8	+10.0
M	DATRONIC RENTAL	1- 8	3/4	+ 1/4	+50.0
A	DCL INC	1- 1	5/8	-	-9.1
N	DPF INC	5- 8	6 3/8	- 1/4	-3.7
N	ITEL	6- 15	11 7/8	-I	-7.7
N	LEASCO CORP	4- 19	17 5/8	-1 1/4	-6.6
O	LEASPAC CORP	0- 1	1/8	0	0.0
O	NRG INC	0- 1	1/8	0	0.0
A	PIONEER TEX CORP	6- 9	7 1/4	0	0.0
N	U.S. LEASING	7- 12	8 3/8	- 1/4	-2.8

SOFTWARE & EDP SERVICES

E X C H		PRICE 1976 RANGE (1)	CLOSE NOV 10 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 3	1 1/8	- 1/8	-10.0
O	ANACOMP INC	6- 11	7	- 1/8	-1.7
A	APPLIED DATA RES.	2- 4	3 3/4	- 1/8	-3.2
N	AUTOMATIC DATA PROC	17- 35	25 1/2	-1 5/8	-5.9
O	COLEMAN AMERICAN COS	2- 6	2 1/2	+ 1/8	+5.2
O	COMPUTER DIMENSIONS	3- 7	5 3/4	0	0.0
O	COMP ELECTION SYSTMS	5- 9	4 3/4	- 1/2	-9.5
O	COMPUTER HORIZONS	1- 2	1 1/4	0	0.0
O	COMPUTER NETWORK	2- 6	5 3/8	+1 1/4	+30.3
N	COMPUTER SCIENCES	4- 8	5 5/8	0	0.0
O	COMPUTER TASK GROUP	1- 2	1 1/4	0	0.0
O	COMPUTER USAGE	3- 6	2 1/2	- 1/4	-9.0
O	COMSHARE	2- 9	4 3/4	0	0.0
O	DATA DIMENSIONS INC	2- 4	3 1/4	+ 1/2	+18.1
O	DATATAB	1- 2	1 1/2	0	0.0
N	ELECTRONIC DATA SYS.	12- 18	15	0	0.0
O	INFONATIONAL INC	1- 1	1/8	0	0.0
O	INSYTE CORP	1- 3	1 3/8	0	0.0
O	IPS COMPUTER MARKET.	1- 2	1 3/8	0	0.0
O	KEANE ASSOCIATES	2- 4	3	0	0.0
O	KEYDATA CORP	2- 5	1 5/8	0	0.0
O	LOGICON	3- 5	4 3/4	+ 1/4	+5.5
A	MANAGEMENT DATA	1- 3	2	0	0.0
A	NATIONAL CSS INC	13- 25	17 3/4	- 5/8	-3.4
A	ON LINE SYSTEMS INC	17- 22	17	0	0.0
N	PLANNING RESEARCH	3- 5	3 1/8	- 1/8	-3.8
O	PROGRAMMING & SYS	1- 1	3/8	0	0.0
O	RAPIDATA INC	2- 5	1 7/8	0	0.0
O	REYNOLDS & REYNOLD	13- 21	16	0	0.0
O	SCIENTIFIC COMPUTERS	1- 1	7/8	0	0.0
O	TYMSHARE INC	14- 28	14 3/4	- 1/4	-1.6
A	UPS SYSTEMS	3- 5	3 3/4	- 1/4	-6.2
N	WYLY CORP	2- 7	1 5/8	- 1/8	-7.1

PERIPHERALS & SUBSYSTEMS

E X C H		PRICE 1976 RANGE (1)	CLOSE NOV 10 1976	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	8- 13	10	0	0.0
O	ADVANCED MEMORY SYS	4- 10	6 3/4	+ 1/4	+3.8
N	AMPEX CORP	5- 10	6 1/8	- 5/8	-9.2
O	ANDERSON JACOBSON	2- 4	2 7/8	- 1/8	-4.1
O	APPLIED DIG DATA SYS	13- 25	16 1/2	-2 3/4	-14.2
O	BEEHIVE MEDICAL ELEC	3- 9	8 1/4	- 1/8	-1.4
A	BOLT,BERANEK & NEW	7- 11	7 3/4	- 5/8	-7.4
N	BUNKER-RAMO	5- 10	6 3/4	- 1/2	-6.8
A	CALCOMP	4- 7	4 3/8	+ 1/4	+6.0
O	CAMBRIDGE MEMORIES	0- 6	5/8	0	0.0
N	CENTRONICS DATA COMP	20- 36	23 1/4	-2 1/4	-8.8
O	CODEX CORP	22- 42	27	0	0.0
O	COGNITRONICS	1- 1	1/2	- 1/8	-20.0
O	COMPUTER COMMUN.	1- 6	4 1/2	- 1/4	-5.2
O	COMPUTER CONSOLES	4- 7	3 1/2	0	0.0
A	COMPUTER EQUIPMENT	1- 3	1 5/8	+ 1/8	+8.3
O	COMPUTER TRANSCEIVER	1- 3	3/4	0	0.0
O	COMTEN	4- o	7	- 5/8	-8.1
N	CONRAC CORP	20- 25	20 3/4	-1 1/2	-6.7
O	DATA ACCESS SYSTEMS	1- 5	5	+ 1/4	+5.2
O	DATA 100	6- 13	6 1/4	-1 5/8	-20.6
A	DATA PRODUCTS CORP	5- 15	10 1/2	- 1/2	-4.5
O	DATA TECHNOLOGY	1- 2	1 1/4	- 1/8	-9.0
O	DATUM INC	1- 2	3/4	+ 1/4	+50.0
O	DECISION DATA COMPUT	1- 4	1 1/2	- 1/8	-7.6
O	DELTA DATA SYSTEMS	1- 1	5/8	0	0.0
N	ELECTRONIC M & M	1- 4	2 5/8	- 1/4	-8.6
O	FABRI-TEK	1- 1	7/8	0	0.0
O	GENERAL COMPUTER SYS	0- 2	3/8	0	0.0
N	HAZELTINE CORP	4- 12	8	- 3/8	-4.4
N	HARRIS CORP	34- 55	50	- 1/4	-0.4
A	INCOTERM CORP	9- 20	10 1/2	-1	-8.6
O	INFOREX INC	3- 7	3 7/8	- 3/8	-8.8
O	INFORMATION INTL INC	10- 18	11 1/2	- 1/2	-4.1
O	INTEL CORP	47-109	47	-3	-6.0
A	LUNDY ELECTRONICS	3- 7	3 3/8	- 1/8	-3.5
O	MST DATA CORP	3- 7	6 1/2	- 1/8	-1.8
A	MILGO ELECTRONICS	15- 21	20 1/2	+2 1/4	+12.3
N	MOHAWK DATA SCI	3- 10	5 3/8	- 3/8	-6.5
O	PENRIL CORP	1- 3	1 7/8	0	0.0
A	PERTEC CORP	3- 8	5 7/8	- 1/4	-4.0
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	3- 10	2	0	0.0
O	QUANTOR CORP	4- 6	4	+ 1/4	+6.6
O	RECOGNITION EQUIP	6- 11	7 3/4	- 1/4	-3.1
N	SANDERS ASSOCIATES	6- 11	7 3/8	- 1/2	-6.3
O	SCAN DATA	1- 4	1 1/4	- 1/8	-9.0
O	STORAGE TECHNOLOGY	9- 13	10	+ 1/8	+1.2
O	T BAR INC	5- 10	5 5/8	0	0.0
O	TALLY CORP.	4- 6	4	+ 1/8	+3.2
O	TEC INC	3- 7	6 1/2	0	0.0
N	TEKTRONIX INC	45- 69	58 3/4	- 3/4	-1.2
N	TELEX	2- 5	2 1/4	- 3/8	-14.2
O	WANGCO INC	11- 22	21 1/8	0	0.0
O	WILTEK INC	2- 2	1 3/8	0	0.0

SUPPLIES & ACCESSORIES

E X C H		PRICE 1976 RANGE (1)	CLOSE NOV 10 1976	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED SYSTEMS INC	1- 4	3 3/8	0	0.0
O	BALTIMORE BUS FORMS	3- 5	3 1/2	- 1/8	-3.4
A	BARRY WRIGHT	6- 10	8	- 5/8	-7.2
O	CYBERMATICS INC	0- 1	1/2	0	0.0
A	DATA DOCUMENTS	25- 45	45 1/4	0	0.0
O	DUPLEX PRODUCTS INC	13- 24	12 3/4	- 1/4	-1.9
N	ENNIS BUS. FORMS	6- 8	5 3/4	+ 1/4	+4.5
O	GRAHAM MAGNETICS	8- 13	10 1/4	+1	+10.8
O	GRAPHIC CONTROLS	13- 19	16	0	0.0
N	3M COMPANY	53- 66	55 1/4	-4 1/8	-6.9
O	MOORE CORP LTD	32- 51	33 1/4	-1 1/2	-4.3
N	NASHUA CORP	11- 18	15 1/4	-1 1/4	-7.5
O	STANDARD REGISTER	15- 19	17 1/4	0	0.0
O	TAB PRODUCTS CO	5- 11	8 3/4	0	0.0
N	UARCO	19- 25	19 5/8	+ 1/8	+0.6
A	WABASH MAGNETICS	4- 9	8 3/8	- 3/8	-4.2
N	WALLACE BUS FORMS	19- 25	22 1/2	+ 3/4	+3.4

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
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